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PLAYGROUND ACTIVITIES

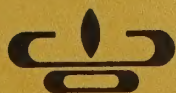
Nature Study



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the FEDERATION of ONTARIO NATURALISTS

and

YOUTH AND RECREATION BRANCH




ONTARIO DEPARTMENT OF EDUCATION

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INTRODUCTION

Many camps have yet to make the most of their resources by including nature activities in their programs. In one sense this seems odd because campers are surrounded daily with some combination of soil, water, plants and animals. Yet at the same time it is understandable because of the difficulty of making nature study interesting for large groups of youngsters. Few leaders have felt particularly qualified to undertake such a program.

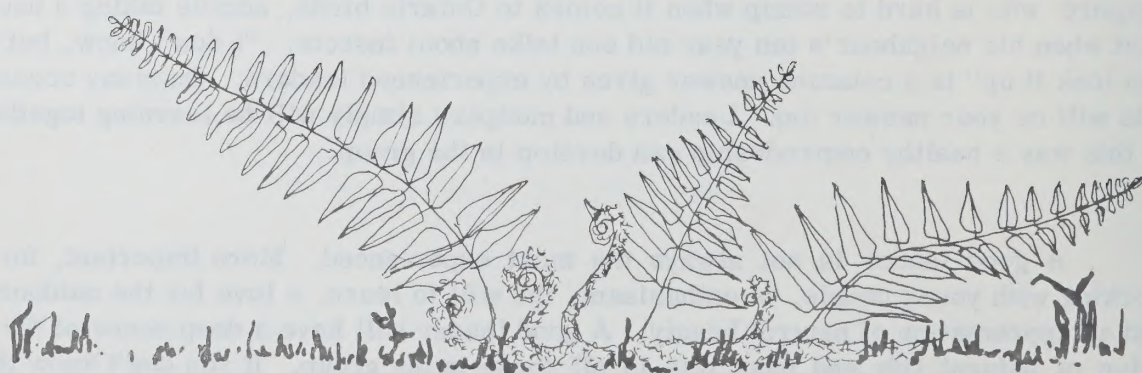
This manual has two purposes. The first is to give some information on what there is to work with and a means of finding out more specific information through inexpensive, easily procured pamphlets and books. The second purpose is to show how nature study can fit comfortably into the whole camp program of crafts, hikes, projects, etc.

No one in the world knows "all about nature", so you are among friends. Everyone, beginner and expert, is in some stage of learning. For instance, one "expert" who is hard to stump when it comes to Ontario birds, admits taking a back seat when his neighbour's ten year old son talks about insects. "I don't know, but we can look it up" is a common answer given by experienced leaders. On many occasions this will be your answer too. Leaders and campers simply will be learning together. In this way a healthy comradeship can develop in the group.

A good leader is not always the most experienced. More important, for working with young people, is enthusiasm, the will to learn, a love for the outdoors, and an appreciation of natural beauty. A good leader will have a deep sense of the value of natural life and pass this to all those in his group. If you don't know the

details but have to look them up—just say so. This state of affairs brings the leader and the group closer together in their quest to find out about things, so it is really to your advantage. Some "experts" will often unconsciously make their audiences hesitate to learn. The beginners fear that their questions would seem silly in his eyes and thus they go home feeling unsatisfied. There is something comforting about all being "in the same boat" especially when it comes to exploring the world of nature.

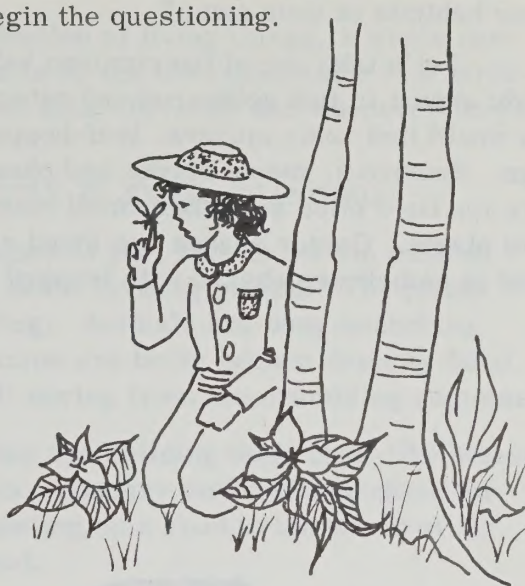
A word of advice—turn to the reference list at the back of the book and order all the free references now and maybe a few of the inexpensive ones. Just browsing through your little nature library will be a good start for this summer's nature program.



OBJECTIVES

In the few weeks of a camp's crowded program you can't hope to do more than open the eyes of the campers to the living world around them and try to stimulate a lasting interest in nature. Children are naturally curious, but they need someone to introduce the fern or snake to them and to begin the questioning.

Too often "nature study" has simply meant teaching the names of a long series of plants and animals and learning to identify them by sight. By itself, this name-learning usually fails to hold the interest of children. Names will have to be learned, certainly, but they should be learned almost unconsciously, as a by-product. The time to learn the name of a plant or animal is when it becomes inconvenient not to know it. When you want to describe its appearance or behaviour, or to compare it with similar forms, then you need to know its name. It is much more fun to find four different kinds of ferns, than to struggle with the name of one.



What sort of objectives should the nature leader keep in mind, then, when he works out a program? Here are four good ones.

FIRST: Nature program should arouse in the camper a lively CURIOSITY about the out-of-doors and the living things that inhabit it.

Curiosity in the younger children will probably require little arousing; you will be kept busy satisfying it! Some of the older campers may have lost this wondering attitude in the struggle of growing up. In this case fresh interest can be awakened by an enthusiastic and understanding leader. Your own enthusiasm is one of the keys to successful nature activity leadership. Be interesting by being interested. Show them that you are discovering new things yourself and are thoroughly enjoying the adventure.

The campers should be set to thinking and finding out how animals and plants go about the business of staying alive, what they eat, whether they change form during their lifetime (caterpillar-cocoon-moth), where they have their homes and what kinds of homes they are.



Much of this can be learned simply by looking and by watching. First hand observations make a greater impression than facts from a textbook. The person who takes on this job of introducing youngsters to their natural surroundings will find an unexpected reward in his own increased understanding of the world around him.

SECOND: Your program should illustrate the arrangement of HABITATS in nature.

"Habitat" is a new word to most of you. It simply means an area in which a certain group of animals and plants are likely to be found living in a sort of community in which they depend on one another for their existence. Some common habitats are dry fields, marshes, woods, rocky slopes, and lakes. Have you one or more of these habitats at your camp?

Let's take one of the common habitats as an example — the dry field. Here we might expect to find goldenrod and aster growing, as well as grasses. On the plants you would find some spiders, leaf-hoppers, grasshoppers, bees, wasps and plant bugs. Sparrows, meadowlarks and pheasants may nest there. Hawks and owls hunt here for field mice and other small mammals. Rabbits and woodchucks feed on the field plants. Garter snakes are found eating the plentiful supply of insects. This feast is sometimes shared with leopard frogs.



Every little woodland houses a host of plants and animals all its own — Solomon's seal, wood fern, ruffed grouse, bluejay, nuthatches, and wood frogs. Certain plants and animals can be found in more than one habitat. However, generally, this habitat concept will give some meaning to the camper's observations.

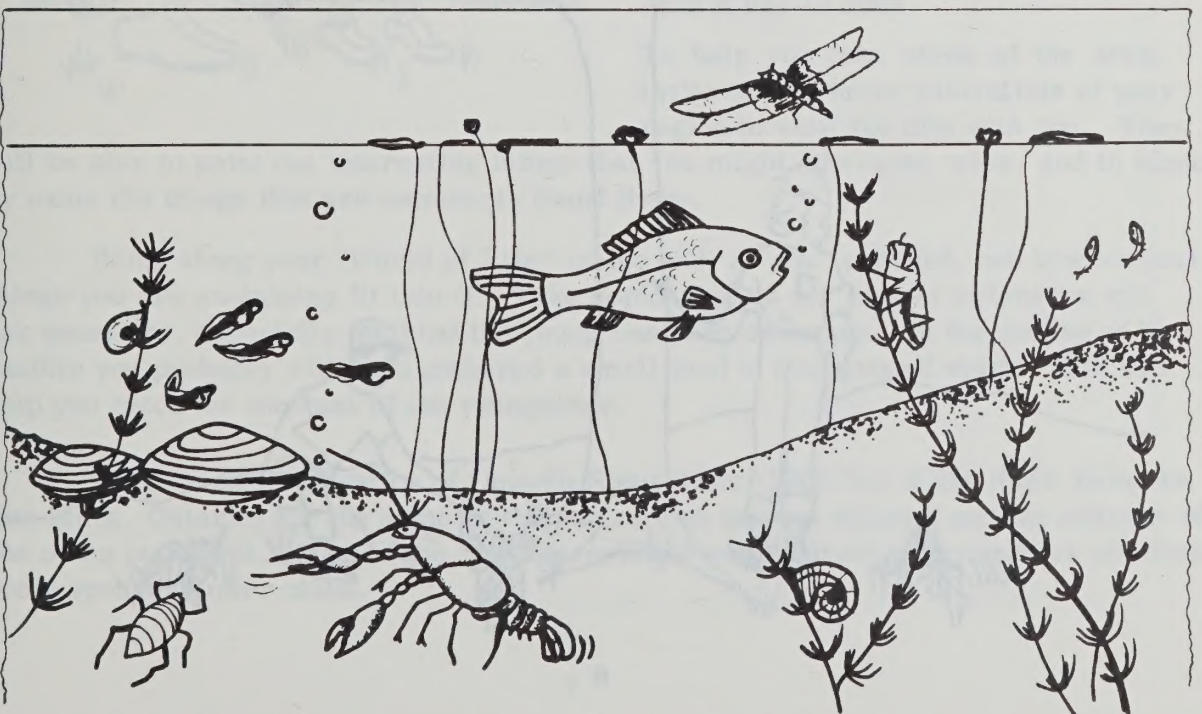
Once the children begin to see this distribution of living things, a whole new vista of understanding is opened up. They are able to see the countryside in a strikingly different light—not only at the campsite, but also wherever and whenever they happen to be out-of-doors.

THIRD: Campers should learn that NATURE IS EVER-CHANGING

Although a wood may seem like a quiet place to you, this is not the case at all. In that peaceful setting a drama of life and death is being played. The plants are growing, flowering, producing seeds and dying. Animals are busy searching for food and hiding from their enemies. Old stumps are being broken down by fungi, insects and birds and someday new plant life will spring from the crumbling remains.

Under the still surface of ponds, stoneflies are building their case-like homes, tiny shrimps are being devoured by water beetles, a hungry turtle is searching for tadpoles, and perhaps a dragon-fly nymph is crawling up a reed to the world of air where it will transform into its graceful adulthood.

The "day animals" are active now, but at night a new group will take over. Every living thing is involved in the struggle to find food and shelter and above all to keep alive. It is somehow a lesson in humility to contemplate the variety of life in this world and to consider how all these living things manage to survive under such widely differing conditions. No naturalist can ever become bored with life. There is always the expectation of discovering a scene he has never witnessed before.

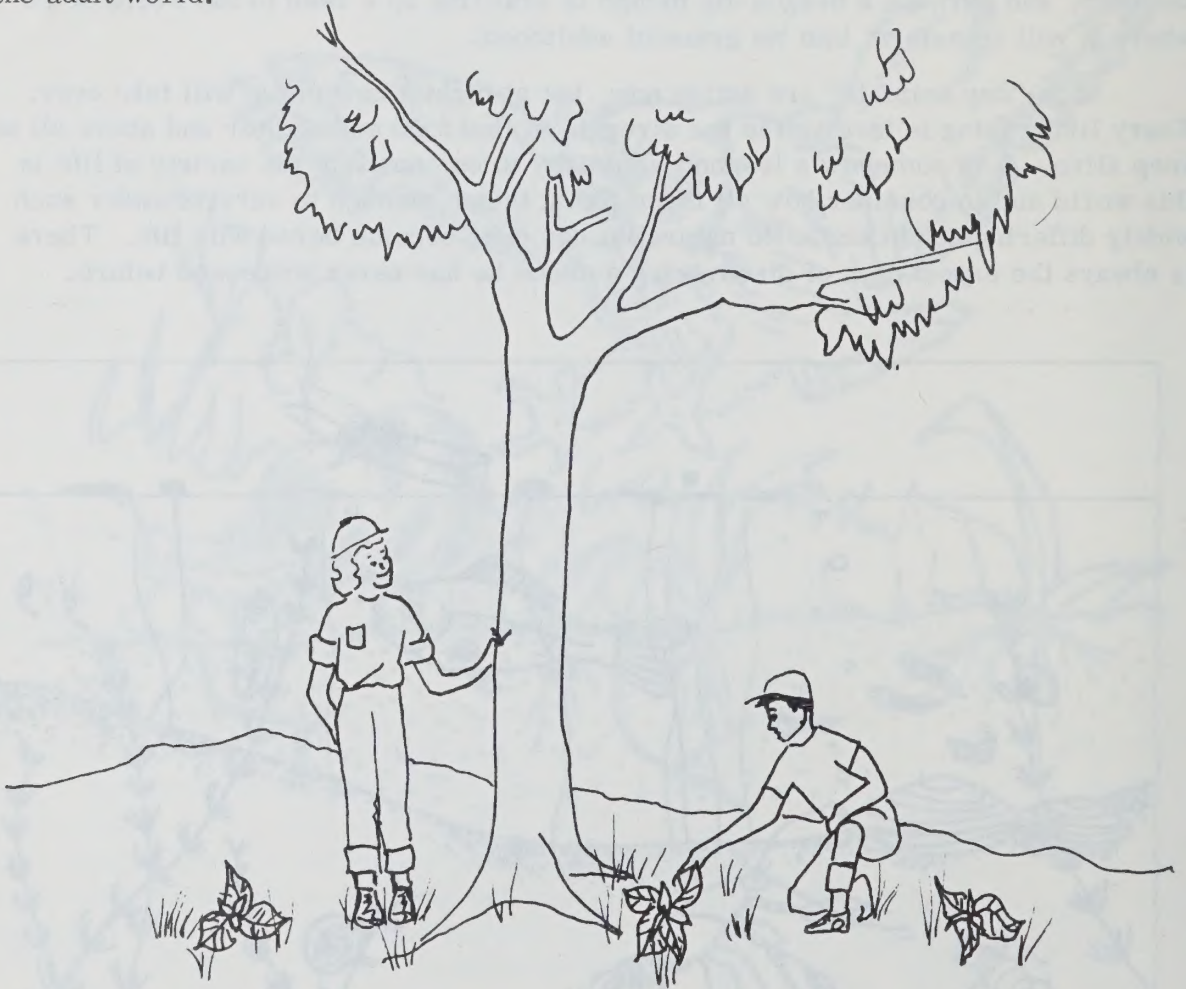


FOURTH: Campers should be able to see how they fit into the picture of living beings; how they are THEMSELVES A PART OF NATURE.

Many children are afraid of the woods, insects, tall grass and other parts of the natural scene. It is natural to fear things unknown, things that they have seen adults shy away from, or about which they have heard disturbing tales. To help the child feel "at home" out-of-doors is certainly one of the objectives of any camp program. Information about natural life and ways in which he is connected with it will dispel much of the child's anxiety. Interest in the familiar will replace fear of the unknown.

All living things are related in some manner to one another. Campers should be helped to see how they are affecting other living things and how they are in turn being affected by them. The leader can explain to campers how they are bound by nature's laws, how their very lives depend on soil and water. These two resources are necessary for the growth of plants on which many animals live (and we are one of the animals). Thus the camper should begin to feel a profound respect for living things and for those resources on which they so closely depend.

With your guidance, these children will be able to lend a sympathetic and intelligent ear to the need for good conservation practices when they take their places in the adult world.



PREPARATION

Before you decide what aspects of nature you will choose for your camp program, it is best to learn just what nature study material you have on or near your campsite. The easiest way to do this is to make a nature survey of your area.

The richness and variety of natural material will vary a good deal from one site to another, but almost any site will have something to offer. Even a city playground usually has a few trees, weeds, insects and birds. Campsites in open city parklands are often not much more productive when the area consists largely of grassy open spots and large trees widely spaced. But a typical campsite is in a

field or meadow, with a bit of woods nearby and perhaps, with good luck, a small stream running through part of it. Water in the form of a stream, river or lake adds greatly to the possibilities for nature instruction.

Perhaps the best sites of all are those situated in river valleys with wooded slopes, or those beside lakes that have forest and clearing about their shores. At this sort of site, the chances are that there is more natural material than can possibly be used during the season.

The important thing is to make the best use of what material there is. And to do this you need to become thoroughly familiar with the area before camp opens, so that you are fully aware of what it has to offer.

To help you take stock of the area, invite one or more naturalists of your region to visit the site with you. They

will be able to point out interesting things that you might otherwise miss, and to identify by name the things that are commonly found there.

Bring along your "World of Life" tables and, as you proceed, ask how various things you are examining fit into it. Take copious notes for further reference and ask questions, especially the kind the young campers often ask. In the course of the ramble you probably will have gathered a small fund of background stories that will help you catch the interest of the youngsters.

Write to the Federation of Ontario Naturalists (1262 Don Mills Road, Suite 49, Don Mills, Ontario) for the name of the nature club in your district and the address of one of its members. Most clubs are interested in nature study programs for children. Some sponsor junior clubs.



Remember that it is neither necessary nor practical for you, as a nature leader, to know the names of all the things that you are likely to encounter. It helps to identify most of the commoner plants and animals by name, but if you can place the remainder in one of the large groups such as "insects", or "ferns", you will likely be doing all that is needed.

If you find yourself in the situation of not knowing the general group into which your discovery fits, then take a sample or draw a sketch, or jot down a description and say — "Let's go to the camp library and try to find out what it is and how it lives". A wise leader will encourage children to help him "look it up". The experience gained in reference work will prove invaluable for the campers in later years and it also will encourage them to do some "looking up" on their own.

When you begin your survey, it is useful to have some sort of a plan to follow. In this way you make sure that you don't overlook any group of natural objects that may be of value in your program. These groups can be set down in a table to serve both as a reference and a check-list. Tables I (Background for Life) and II (Life Itself) are set up in this fashion. The groups listed are described briefly in the SETTING and LIFE ITSELF chapters. More detailed information must be sought in appropriate reference books, some of which are listed at the back of this manual.

TABLE I — Background for Life *

<u>STARS</u>	<u>SOIL & WATER</u>
How far?	Soil profile
A light year	Erosion
The constellations	Water routes
<u>ROCKS</u>	<u>WEATHER</u>
What kind -	Temperature
- granite?	Rainfall
- limestone & shale?	Clouds
Fossils	Wind
Glaciers	Air Pressure

* Table I is described in SETTING chapter.

TABLE II — Life Itself *

PLANTS

Spore Plants:

Algae	- in ponds or streams
Fungi	- in shady, damp places
Lichens	- on rocks and tree bark
Mosses	- some in damp, dark places; others in dry, sunny places
Club Mosses	- northern and central Ontario woodland
Horsetails	- roadsides, hillsides, open, with some shade
Ferns	- in shady or partly shady woods

Seed Plants:

Evergreen trees
Broad-leaved trees
Shrubs
Wild Flowers
Weeds

ANIMALS

Without Backbones:

Protozoans
Worms
Molluscs - snails, slugs, clams
Crustaceans - crayfish, water-fleas, sow-bugs
Centipedes & Millipedes
Spiders
Insects

With Backbones:

Fishes
Amphibians (frogs, toads, newts, salamanders)
Reptiles (snakes, turtles, lizards)
Birds
Mammals

* Table II is described in LIFE ITSELF chapter.

BACKGROUND FOR LIFE

If you were selecting an area to build a log cabin, you would probably ask yourself questions such as:

Is there good drinking water nearby?

Is there sufficient shade?

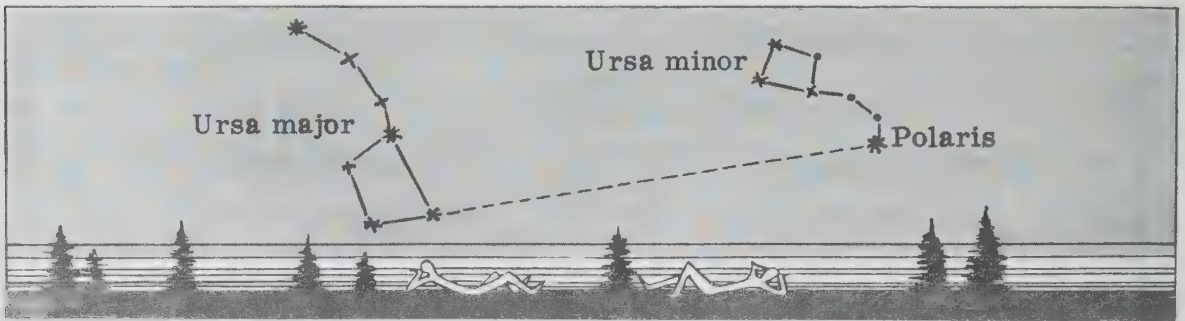
Is there a high, dry, flat place on which to build?

Could supplies be brought in easily?

What is the surrounding area like?

You would finally choose a spot that was satisfactory for you to live comfortably, with a minimum of problems. Animals and plants tend to live in places that satisfy their needs too. They require a setting or background in which to live. Different plants and animals will be found flourishing in a multitude of different settings. Newly hatched painted turtles head straight for the nearest water where they will find food and shelter. Some people have tried to take a Jack-in-the Pulpit out of its damp, shady woodland setting and plant it in their sunny, sandy gardens. Jack soon died. His new home was not at all satisfactory to him.

So we can see that the setting for plants and animals is an important consideration in any nature study program. Let's look at Table I and see what things to look for in the background for life (page 8).



STARS

You will need a good guide in this fascinating part of camp activity. Choose one of the references given on page 87. Binoculars (or a small telescope if you are fortunate) will be helpful in looking at the moon. Lying on one's back and picking out the constellations is wonderful fun on a clear night. Ground work in learning the shapes and positions of these star groupings can be done on cloudy evenings or rainy days. Each camper can map out one galaxy and try to guide others in finding it when the opportunity arrives.

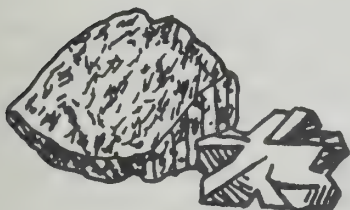
Boxes with holes punched in them to represent the constellations can be made. When it is dark, shine a light from behind and there is the constellation! Now pick out its position on a big map of the sky.

ROCKS

The kinds of rock and soil in your campsite area have an important influence on the types of plants and animals to be found there, so you need to know a little about them.

The Pre-Cambrian Rocks

If your camp is in northern Ontario, or in some parts of the eastern section of the province, it is probably situated on what is known as the Pre-Cambrian Shield or Canadian Shield. These rocks were formed about a thousand million years ago and are about as old as any on the surface of the earth. They are so old that they contain no traces of living animals in the form of fossils.



The Pre-Cambrian rocks are chiefly granite. They are hard and resistant to the effect of weathering even over a long period of time. Except for some glacial deposits, little or no soil covers them.

Many of Canada's valuable mineral deposits are in or along the edge of the Pre-Cambrian Shield. If your camp is in this region, you might like to form a mineral collection for display, but you will need help in identifying the different minerals. Your local representative of the Ontario Department of Mines is a good person to see about this. A collection of 70 samples of different minerals and rocks, made up as a set for display, can be obtained from the Publications Branch, Ontario Department of Mines. (See Reference 4).

The Marine Rocks

If your campsite is in southern Ontario, the bed-rock may be covered with soil and there may be no exposed rock at all. If you do have outcrops of rock it will probably be sedimentary rock - that is, it was formed as a deposit at the bottom of an ancient sea. That is why it is called 'marine rock'. These sedimentary rocks were formed about 350 million years ago. Over a long period of time, one deposit was laid down on top of another, and the rock so formed has a layered form that can be seen in river valleys or, for example, along the Niagara escarpment. Limestone and shale are the two kinds of marine rocks you are likely to find.



Fossils - By the time these sediments were being formed, there were animals living in the seas and their remains are to be found today - preserved in the rock as fossil forms. In some places in southern Ontario these fossils are really abundant and it is no trick to find them. Various kinds of coral and shells are the commonest forms. They make fine exhibits for your nature centre.



The Glaciers

About a million years ago, in what geologists call the Pleistocene Era, the earth's climate began to turn cold and great sheets of ice spread slowly southward over Canada and down into the northern United States. Since that time, the glaciers have made four advances over our land and, in warmer periods between, retreated northward again. We are now living in one of these periods of glacial retreat, for the last glaciers left our part of the country only about 15,000 years ago and many glaciers still exist in far northern Canada.



When the ice advanced, it scraped soil and loose boulders off the rock surface and pushed them southward. When the glaciers melted, the accumulated soil was deposited in different ways that we can learn to recognize. With the melting ice, large rivers and lakes were formed and they too had an influence in moulding the shape of the land as we now know it.

The influence of the ice age can be plainly seen at and around your campsite if you know how to interpret the signs. In the north, if you are mostly in bare rock, it got that way because it was swept clean of soil by the ice. If you are situated on a flat plain, it may have been formed by an old glacial lake. If you are in a valley, it may have been carved out by a river formed in glacial days. Perhaps you are in country that has rolling, smooth-topped hills that were heaped up that way by the ice.

You can learn a good deal about your own particular area, if it is the south, from a book called THE PHYSIOGRAPHY OF SOUTHERN ONTARIO (Reference 5). This book has soil maps and the text covers the various regions in detail, section by section, so that your area will be included. It describes, for instance, the origin and character of the clay plain that is so typical of the Toronto region. It explains how glacial deposits such as eskers, drumlins and moraines were formed and has maps that will show whether there are such things in your neighbourhood.

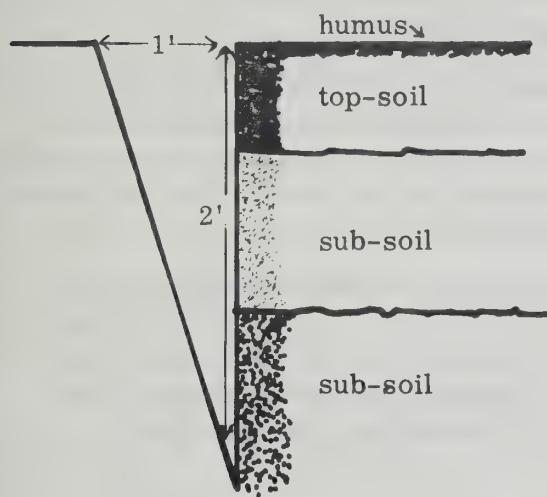
SOIL AND WATER

Soil is roughly the layers occupied by the roots of plants. These layers may be shallow or deep. Soil consists mostly of rock fragments and a smaller amount of the rich material formed by the decomposing bodies of plants and animals. Glacial action had a lot to do with determining the amount and type of soil you have. The soil in turn largely determines what plants can grow there.

If you are in the north (on the Canadian Shield), the soil is likely to be shallow and better for growing trees than food crops. Chemically, it will probably be acid rather than alkaline. This too has a part in determining what kind of plants grow there.

In the south, your best reference for finding out about your soil is again the **PHYSIOGRAPHY OF SOUTHERN ONTARIO** which contains soil maps for each region.

Soil Profile



A soil profile is quite simple to illustrate. It will enable you to separate the soil into at least three different layers.

Dig a hole as indicated in the diagram. Examine the vertical section carefully. You should see that the soil is not the same colour all the way down, but has roughly three different layers.

Steep banks or earth cuts along highways or railroads can be cleared with a spade to show these layers too.

First, on top, is the humus — a dark, thin layer of decaying plant and animal matter. Next, you come to the shallow, but extremely valuable fertile top-soil from which plants obtain most of their nourishment. Beneath this is the relatively infertile sub-soil.

There are some other things that you might look for in the profile. How deeply do the roots penetrate? Are the soil particles a different texture in the different layers? How does this profile compare with others you have taken?

It takes nature about five hundred years to make one inch of the precious top-soil that produces all our food. A country with little top-soil is a hungry country.

(For a craft suggestion concerning soil profiles see page 60.)

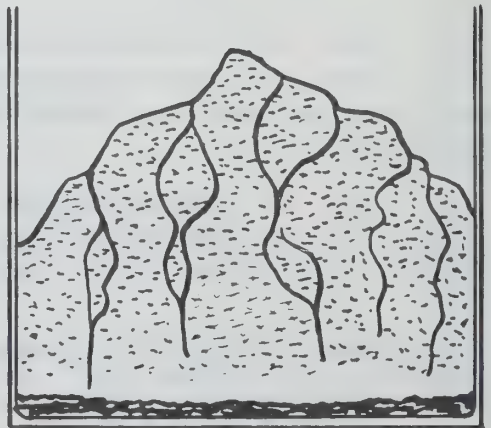
Erosion

This is the name given to the moving of the soil by wind and water. Water erosion can be demonstrated by the campers themselves. Build a miniature hill out of sand or bare soil. Now make it rain by steadily sprinkling water from a watering can. At first the water will soak into the hill, but as the rain continues the water will start running down the hill carrying some of the soil with it. Erosion has begun. The path of the running water may form gulleys or streamlets in the hill. These are signs of erosion.

The campers can be on the lookout for these signs in their own community. Perhaps sand is being scooped away from the beach by the waves or a hill nearby has been stripped of its vegetation and is already showing signs of gulleying. Maybe the bare river bank has some deep ruts in it. Erosion often carries away the important top-soil on which food plants grow. It dumps the soil into rivers and lakes, so that they become shallow and muddy. Water animals and plants are choked out. The run-off water sometimes collects in the valleys where the rivers and streams overflow and a flood results. Have any of the campers seen a flood? Perhaps they would like to tell the rest of the group about it.

Wind erosion is merely the blowing away of the soil by the wind. Has anyone ever seen drifting dust over a bare field on a windy day? Soil does not blow away if it is well covered with plants, and it does not wash away if trees are planted on top of hills and grass is planted on the slopes and on the level to hold the blotter-like top-soil in place, so that it can absorb the water.

Let's all think about these few inches that support our lives—the top-soil. A good nature museum display is a soil profile (see crafts), or a jar of top-soil (labelled "brown gold") accompanied by a chart showing how to save top-soil and how to lose it. Two boxes with miniature hills showing one with protected top-soil and the other with signs of erosion, could serve as an erosion exhibit.



Water Routes

Life cannot exist very long without water. Water is continually travelling from the earth to the air and then back to the earth again. It returns to the earth from the clouds in the form of rain or melting snow. This precious water can take different routes when it falls on the land—water routes let's call them.

It can be absorbed by the top-soil.

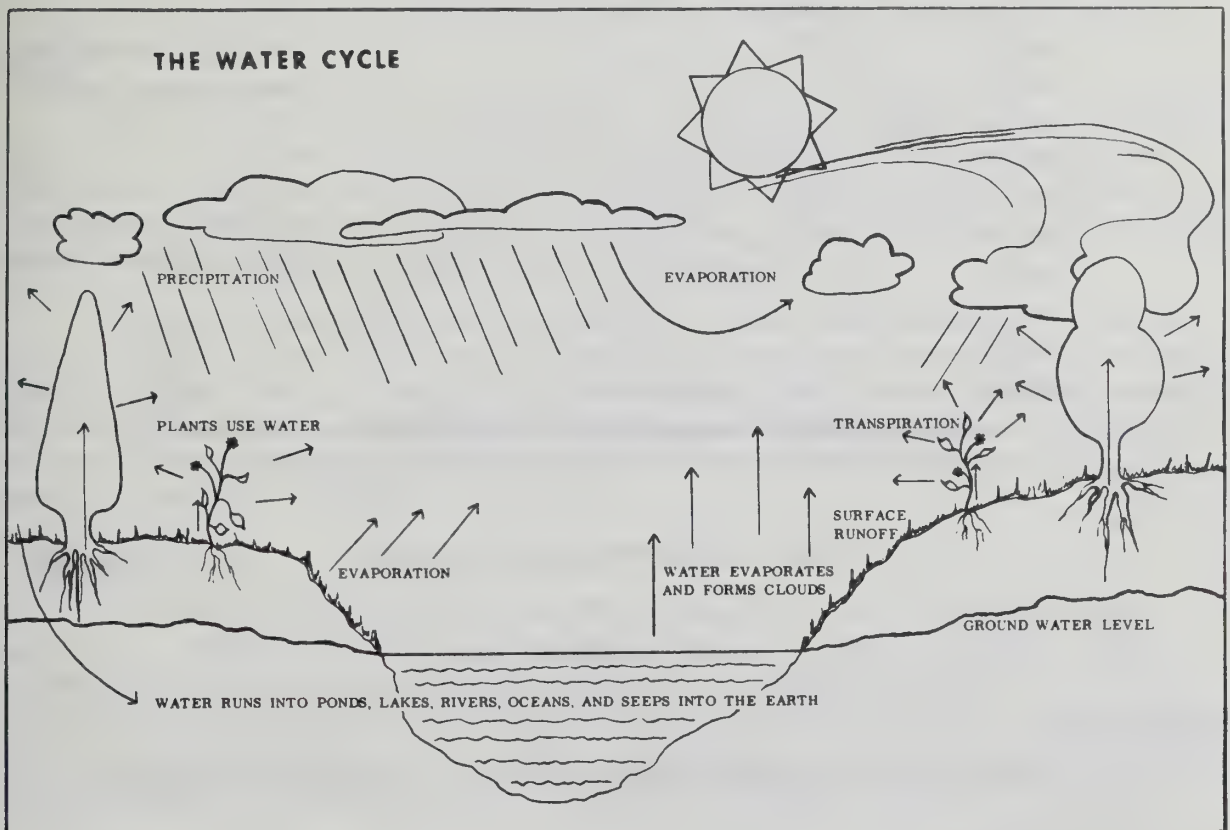
It can filter through the soil and collect on the rocks beneath.

It can run off the land into the lakes, rivers and streams.

The first two routes are the important ones for they help to hold water in places that can be used by plants. The water that filters down to collect on the rocks is called the groundwater. It supplies water to our springs and wells. When you hear of the wells running dry, you know that groundwater is at a low level in the district.

The third water route, when the water runs off the land, is the dangerous one—the one we must try to prevent. Water will run off rock and sand, but it is absorbed if it falls on land with a blotter-like top-soil and humus layers held together by the roots of trees and other plants. If all the plants are removed, the top-soil often blows away and any rain that falls runs off the infertile sub-soil, like water off a plate.

The water route story may help you to give the campers a greater understanding and new respect for the common stuff—water.



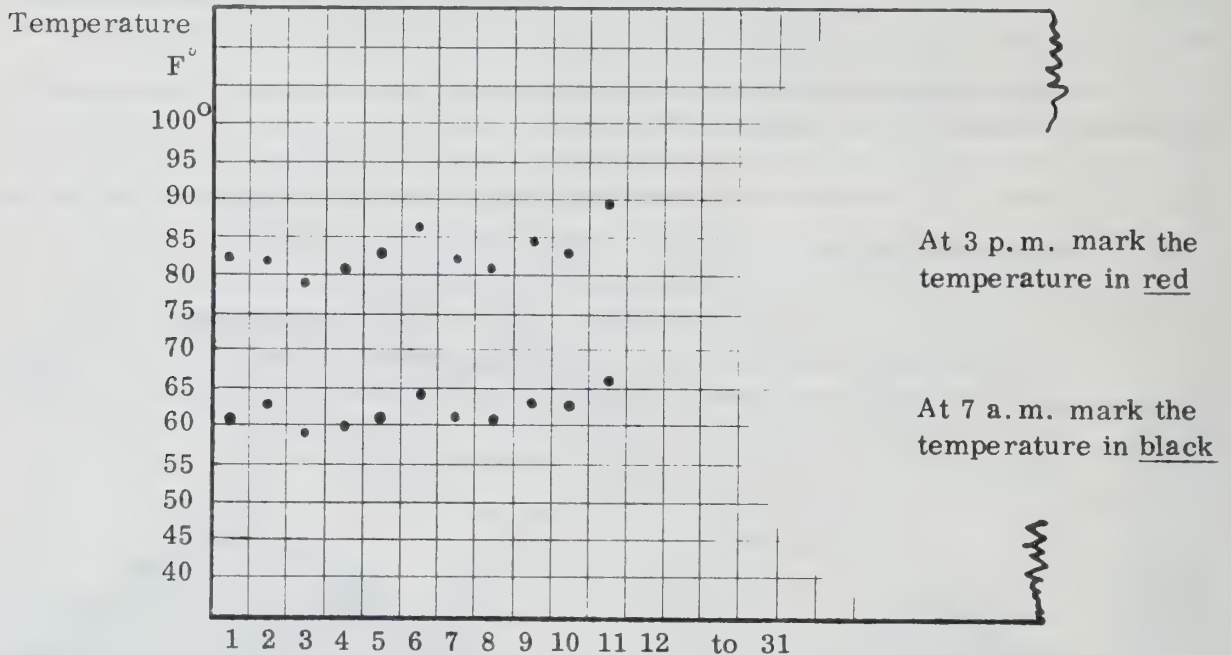
WEATHER

"Keeping the weather" at camp is one activity in which everyone can take part. Each day a different pair of campers can be the weathermen. Their job will be to collect the weather information for the day and to post it on the camp weather bulletin board (with a small table underneath). Here is a list of weather data you may want to collect.

Temperature

An inexpensive thermometer from any hardware store is the only equipment you need. Hang it outside in a sheltered, shady place, facing north. The "weathermen" for the day should take the temperature twice—once at 7 a.m. and again at 3 p.m. Temperature readings at these two times will correspond roughly with the minimum and maximum (lowest and highest) temperatures during the daylight hours.

The information gathered can be marked on the weather office monthly temperature chart (see example). This chart can be outlined by the leader before camp begins or it can be prepared by the campers themselves as a project.



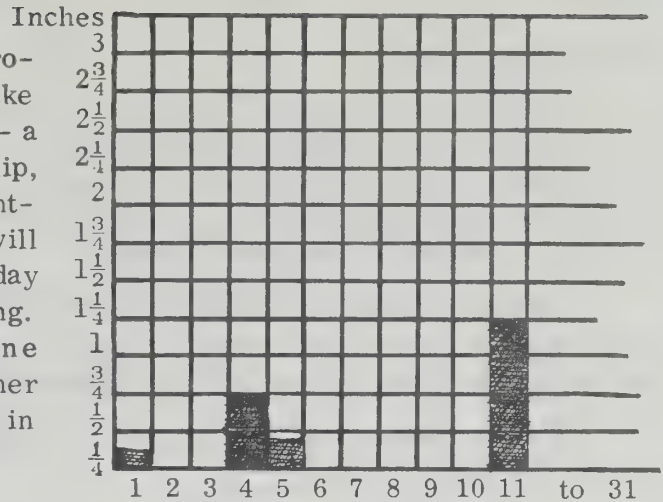
JULY TEMPERATURE CHART
for
CAMP HACKMATAK

Suggestions:

1. Rule the chart on white cardboard approximately 20" square (this leaves room for headings.)
2. Make squares $\frac{1}{2}$ ".

Rainfall

Reference 10 (page 86) will provide you with instructions on how to make an instrument to measure rainfall - a rain guage. An open tin can with no lip, a wooden ruler, and a narrow straight-sided bottle (olive, chili sauce type) will be needed. Read the rainfall once a day with the morning temperature reading. A monthly rainfall chart, like the one illustrated, should be put in the weather office so that the weathermen can fill in the amount measured.



JULY RAINFALL CHART

Clouds

Again consult Reference 10 for the names and descriptions of the different kinds of clouds you might expect to see. Some common types of clouds are cumulus (like fluffy cotton batting), cirrus (high and wispy) and nimbus (big, black rain clouds). A camp weather log in the form of a lined scribbler is a good place for the weathermen to write their daily cloud description. Perhaps they would like to draw a picture of the clouds too. Each entry in the log should have the date and names of the campers who took the weather observations for that day.

Wind

Which way is the wind blowing? Is it a north wind (coming from the north)? This could mean colder weather. A leader can encourage his campers to keep the "weather eye" open for any shifts in wind direction. Watch the leaves or campfire smoke when hiking; the water surface when boating. A wet finger held in the air will get cold on the side against which the wind is blowing.

A simple weather vane can be made from a straw with a paper feather stuck in one end. Attach this with a pin to an eraser on the end of a pencil. Place the pin about two inches from the feather. For directions to make a more elaborate weather vane see Reference 10. This group of weather pamphlets will include a description of how to measure the speed of the wind too. Wind records for each day also may be placed in the weather log book.

Air Pressure

A valuable piece of weather data is measured with an instrument called a barometer. When the barometer falls, look for cloudy, colder or perhaps rainy weather. A rising barometer probably means clear, warmer weather. The weight of the air or air pressure is constantly changing. How can you tell when it is getting heavier or lighter? Write for the weather pamphlets for instruction on how to measure air pressure. Record barometer "rising" or "falling" on the log.

Further Suggestions

Have the "weathermen" listen to the morning forecast on the radio and post it on the weather-office board for everyone to see, and to compare it with the weather at their own camp-site. Encourage the campers to try their own hands at forecasting the weather. Suggest to them that they make observations just after breakfast or just after campfire.

















Make the weather office a colourful spot at camp—brightly coloured "Weather Office" sign, a picture on the cover of the log book, charts done in coloured pencils, post weather pictures cut out of old magazines, etc.

Thermometers could be given to the weathermen with the best sets of records at the end of camp.

A topographical map of your area (Reference 7) is a useful and interesting addition to your camp bulletin board. Keep an extra copy to take on hikes. It will give you the position of old roads, marshes, hydro lines, buildings, etc.

The chances are that you can also get a set of aerial photographs that will include your area (References 9 and 10), though they are not available for all parts of Ontario. They give a new and fascinating view of your campsite

You may also make the campers familiar with some of the following meteorological symbols:

	cirrus		scud
	cirro-stratus		haze
	cirro-cumulus		mist
	alto-cumulus		fog
	alto-stratus		smoke
	stratus		drizzle
	strato-cumulus		rain
	cumulus		thunderstorm

WEATHER REPORT

DATE:

July 18, 1965

WEATHERMEN:

Johnny Rogers
Danny Smith

TEMPERATURE:

7:00 a.m. - 65° F

3:00 p.m. - 79° F

RAINFALL:

- 0 inches

CLOUDS:

7:00 a.m. - (symbol)

3:00 p.m. - (symbol)

WIND:

South, gentle

BAROMETER:

Rising

FORECAST:

Clear and warmer

REMARKS:

Saw heat lightning at 5:00 p.m.

LIFE ITSELF

Now we come to the plants and animals. These are the living things, with their own habits and life stories. Camp is a marvelous place to uncover some of these life dramas.

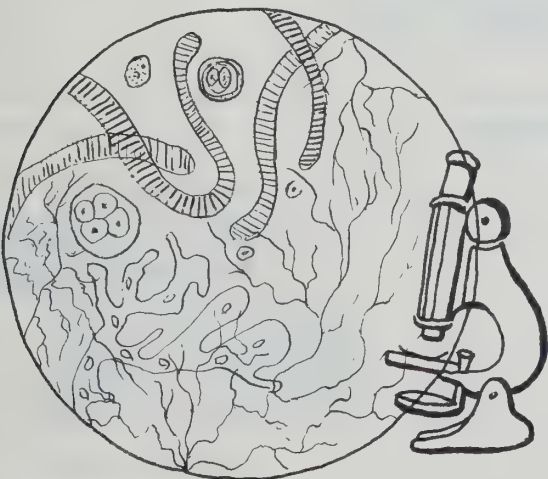
Let's start with the plants. We will follow them along in order of Table II, page 8. The kingdom of plants can be divided into two parts — spore plants and seed plants.

SPORE PLANTS

Spore plants multiply themselves by shedding a fine powder made up of particles called spores. These spores produce the new plant. Place the head of a toadstool, underside down, on a white sheet of paper and keep it in a dry place overnight. In the morning you will find that spores will have fallen on the paper and formed a delicate pattern called a spore print.

If you can learn to place a spore plant into one of the following categories, you will be doing all that is needed. Later you might like to make a project of learning to tell the different ferns in the area apart. There are not too many of them to tackle and Reference 19 or 20 will be of great help. The club-mosses form another small group on which to practise identification. You will only find 5 or 6 in any one district.

Algae (pronounced al-gee; sing. alga)



Algae are such small plants that you are unlikely to be considering them unless you have a microscope to see them. They are found clinging to rocks or floating freely in ponds and streams, sometimes in such dense quantities that the water has a greenish or bluish tinge (pond scums). "Frog spit" — that pale, green, frothy mass often seen in ponds is formed by one of these algae. It resembles long, green, slippery hairs when viewed with the naked eye.

Fungi (pronounced fun-ji as in jive; sing. fungus)

This group includes the toadstools, mushrooms, moulds and brackets.

As has been mentioned previously, the caps of toadstools and mushrooms can be used for obtaining spore prints that may surprise you with the delicate beauty of their patterns. In one type of fungi the spores are shed from rows of filamentous gills. In other types they are shed either from the pores or tooth-like structures beneath the cap.

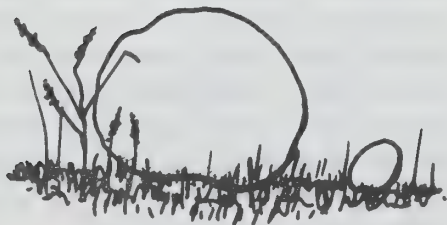
You will be asked which fungi are edible and which are not. More than 90% of them are edible and quite delicious, but a small group are not. Unless you are perfectly sure, it is better not to experiment. Even mushroom experts admit that no one is ever perfectly sure. There are two that are deadly poisonous, the Fly Agaric and the Death Angel. It is well worthwhile to look up their pictures. Look them up in Reference 17.

The fungus group is important to man, both as a help and as a hindrance. Have you ever had a shot of penicillin? It is produced from a bread mould. Many of our life-saving antibiotics are formed from various types of fungi. Fungi also play a large part in breaking down dead plants and animals into substances which enrich the soil. Living plants and animals may suffer from fungus growth e.g. bracket fungi on trees, tiny fungi on insects, and fungi diseases.

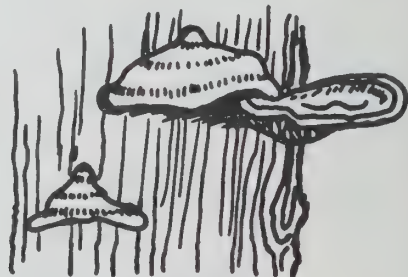
One type of fungus that many of the campers will recognize is the puff ball. Earth stars might also be found in shady soil or in open woods. Bracket fungi are commonly found on tree trunks.



Earth Star



Puff Ball



Bracket Fungi

Lichens (pronounced like-ens)

Lichens are especially interesting because they are really a combination of two quite different kinds of plants—a fungus and an alga—that are able to live in very close association with one another to their mutual benefit. Different combinations of them grow in such definite shapes and forms that they make up a distinct category.

The fungus forms by far the larger part of the lichen. In fact, all that you are likely to see of the lichen will be the fungus part of it, for the alga is hidden beneath the surface of the fungus where you can't see it.

Now here is the interesting relationship between the two plants. The alga does all the food manufacturing, both for itself and for the fungus. In return the fungus absorbs water, protects the alga and prevents it from drying out. By this "mutual aid" arrangement, the combination of fungus and alga is able to live in exposed places such as on bare rocks or ground, and on the bark of trees where neither of the partners could survive alone.

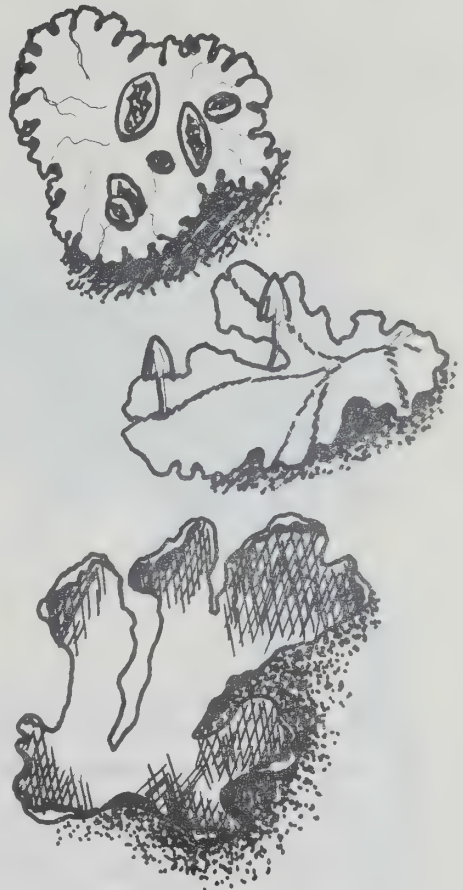
Most of the lichens that you will see will be of the scaly or crusty type, blue-grey, grey-green or green-brown in colour, although some are brilliant orange or red. "Grenadier Guards" are tiny grey stalks with red tips which look like hats. "Pixie Cup" has grey-green stalks widening into shallow cups.

The famous "reindeer moss", so important as a food for herds of reindeer and caribou in arctic regions, is not really a moss, but a lichen. It forms an elastic pale grey carpet in wet weather, and a crisp brittle one in dry weather.

Lichens have been used since earliest times to form dyes for colouring the woolen cloth we call tweed. All lichens make good terrarium specimens.

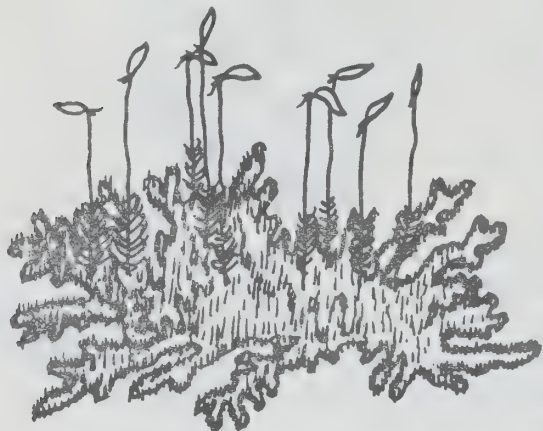
Mosses

Mosses of one kind or another are pretty common throughout Ontario and your campsite will likely have its share. Mosses grow on the ground, on trees and on rocks—both in dry and wet places. Most mosses are difficult to tell apart and you need not try.



If your campsite is close to a northern bog, one moss you should be able to recognize is sphagnum or peat moss. It will cover almost the whole floor of the bog. Sphagnum can absorb an extraordinary amount of water and was used by native Indians as an absorbent bandage. Indian women packed their babies' cradles with sphagnum for it proved to be soothing to tender skin. When dried out in the sun it makes good bedding for camp-outs, or on a smaller scale for mice and other animal cages.

Another kind of moss you might see is pin cushion moss. It is a bright green colour and grows in soft small mounds on the floor of the woods.



On some beds of moss campers may notice small hooded capsules on the ends of fine hair-like stalks. These are the capsules that hold the spores. Be sure to take a look at one with your magnifying glass and try to find out how it is constructed.

Different types of mosses make a fine carpet for your terrarium.

Club Mosses

This is a small group of plants that will interest you, especially if your camp is on the Canadian Shield. One kind looks something like a miniature conifer tree. In fact, during the Coal Age (about two hundred and fifty million years ago), club mosses grew to be one hundred feet tall.

The spore cases are quite difficult to find, but in late summer you may see the cone-like structures containing spores. Some club mosses have the spore cases in the axils of the leaves.

There are six different kinds of club mosses in Ontario. A collection of the ones growing in your area, planted in a low box, would make a good exhibit. It will look like a miniature forest.

You have probably noticed or perhaps even worn those attractive Christmas corsages. Most of the "greenery" on them is club moss



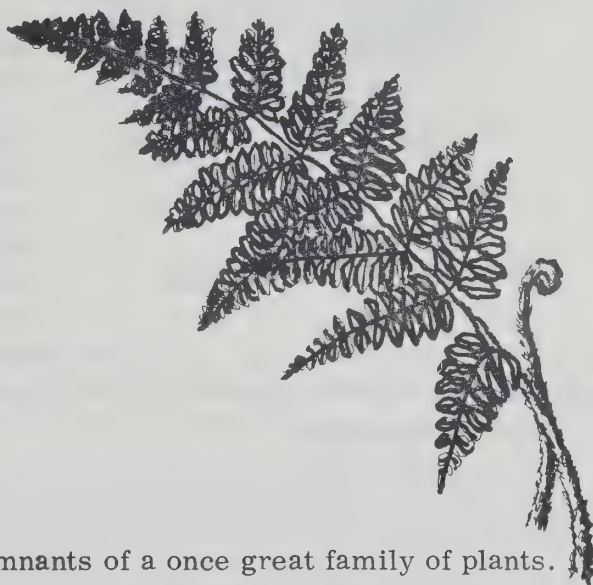
Ferns

Do get acquainted with the ferns. They are fairly easy to sort out especially with Reference 19 or 20 as a guide. Ferns grow in a variety of habitats—dry fields, moist woods, and rocky slopes.

In midsummer, brown spots will be noticed on the underside of some of the fern fronds. These are clusters of spore cases. However, some ferns produce their spores not under the fronds, but on a separate stalk altogether.

Most ferns are simple to display. Press the frond dry and flat in some kind of press (see crafts), and then tape them on a piece of cardboard. If the fronds have spore case spots, be sure to mount one underside up to show the pattern. Record the ferns' habitat on the sheet. When collecting ferns you can pick one or two fronds from a clump without hurting the plant.

Small ferns such as the Christmas fern (each leaflet looks like a Christmas stocking) make attractive additions to terrarium displays. Various kinds are good specimens for spatter prints and blueprints (see crafts). Lampshades of two layers of translucent parchment, with pressed ferns or other plants between, are becoming popular. Perhaps you might like to use this as a craft project.



Horsetails

The horsetails of today are the remnants of a once great family of plants. Horsetails used to be tall trees during the prehistoric period called the Coal Age. Much of our coal in North America was formed by the compressed remains of these ancestors of our common horsetail. References 1, 19 and 20 will give you pictures and a description of these plants.



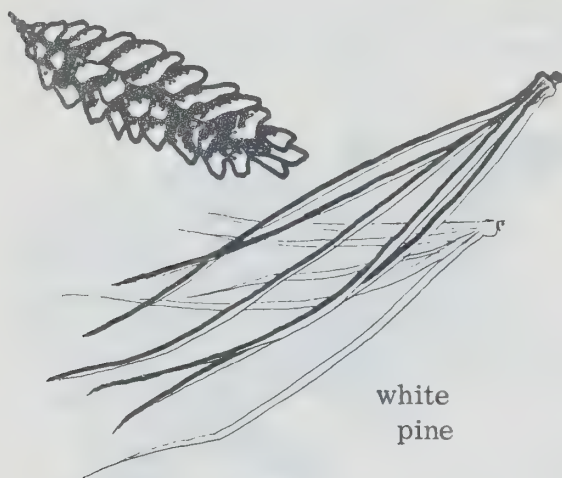
"Scouring Rush" is another name given to horsetails for they contain an abrasive called silica in the walls of the stem. Campers might use them for scouring the pots on cook-outs.

If you find some stiff, upright, unbranched stems of horsetail, try to separate the different sections and then put them back together again. Each section usually shows a distinct pattern that you can examine with your hand lens.

SEED PLANTS

A seed contains a tiny baby plant and the food for its early growth. It is produced in the central part of the flower. Since spore plants have no flowers, they do not produce these seeds. Some flowers are male and some are female. Some are both male and female together. When the yellow, dust-like pollen from the male falls in the centre of the female flower, a seed is on its way to being produced. Many plants have marvelous methods for spreading their seeds. We will discuss this story in a later section.

Evergreen Trees



In general, these trees bear cones, have needle-shaped or scale-like leaves, and do not shed their leaves all at one time. As a group, they are also called needle-leaved trees or coniferous trees (because of their cones).

The seeds of evergreens are found on the inner surface of the scales (modified leaves) making up the female cone. (This cone is the evergreens' strange female flower.) If you bring a cone into the house during the winter and let it dry out, you will find that the scales will open and you can shake out

the ripe seeds. The male cones are very small and fall from the tree after producing their pollen in the spring.

In Ontario there are a dozen native evergreens and several kinds brought to Canada from other countries (introduced). The location of your campsite will have a lot to do with what evergreens are to be found there. White pine, hemlock and white cedar are fairly common over most of Ontario. White spruce, black spruce, balsam and tamarack are most common in northern Ontario. Jack pine is found on sandy soil. Red pine and scotch pine are popular trees for plantations. Norway spruce and Colorado blue spruce are commonly used for wind-breaks and in landscaping.

Campers should learn to recognize and name the different kinds. Try your hand at the game on the next page and then have a look at the key from which it was developed—THE FOREST TREES OF ONTARIO, Reference 28, page 88. It is really a kind of snakes-and-ladders game in which you follow a trail through a series of questions with two alternative answers, 'yes' or 'no'. Each question represents a fork in the trail and the answer tells you which alternative route to follow. The book has also photographs and descriptions of all the evergreens that you will see.

A collection of cones from the various types makes an attractive exhibit. By using lettered cards and sample twigs bearing needles, you can also put together a wall display that will represent the key and serve as a handy guide.

Wildflowers and Weeds

There will be a good many different kinds of wildflowers in your area and it will be difficult for you to know them all. However you will likely find that a few common kinds will account for nearly all those flowering during the camping season. One of the guides listed in the reference section should be in your pocket most of the time. The assistance of a botanist would be a great help if you know any such person who lives near the camp.

If you watch out for the habitat preference again, you are likely to find that there is quite a sharp division between the kinds of flowers found in open fields, meadows and roadsides, and those found in woodlands. Table III gives you examples of common and conspicuous flowers and weeds to be found in summer.

While most of the woodland flowers are native to Canada, many of those found in meadows and on roadsides have been brought to North America from Europe either by accident or by design. Common examples of such introductions are ox-eye daisy, dandelion, thistle, devil's paint brush, burdock, several kinds of mustard and false buckwheat. Most of the so-called weeds are merely introduced plants that have flourished and spread in the country. They are called weeds because they are growing

where you don't want them to grow. In England "goldenrod" and "mullein" are cultivated in gardens. Weeds are a good source of material for day-camps in the city.

The different kinds of plants on your campsite will come into flower and then bear fruits and seeds from spring through summer into fall. Flowers that are conspicuous at the beginning of the summer will give way to others before camp is over, so that the wildflowers and weeds will give a change and variety to your scene.

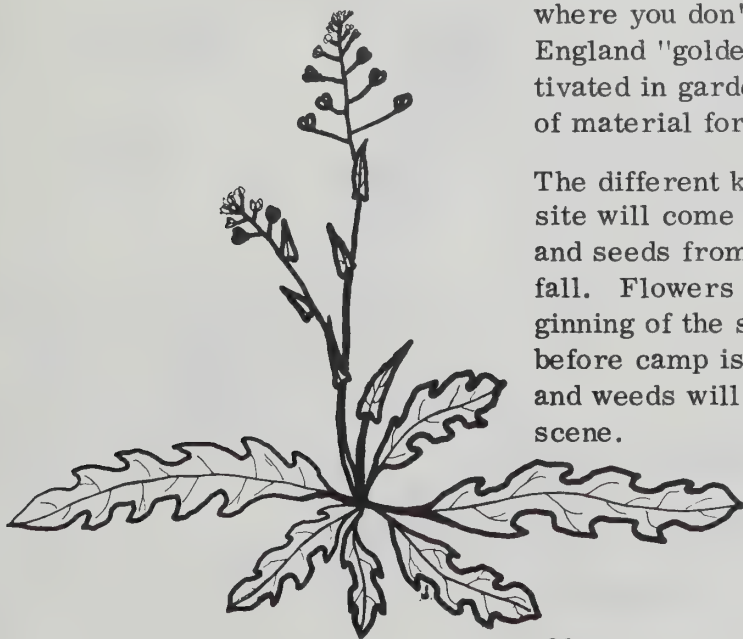


TABLE III: Wildflowers and Weeds Common in July and August

<u>SOUTHERN ONTARIO</u>		<u>NORTHERN ONTARIO</u>	
<u>Meadows:</u>		<u>Meadows:</u>	
Aster (August)	Goldenrod	Bindweed	Goldenrod
Bergamot	Heal-all (Self-heal)	Buttercup	Heal-all (Self-heal)
Bladder campion	Hound's tongue	Cinquefoil	Meadow rue
Burdock	Milkweed	Clover (red alsike)	New England Aster
Buttercup	Mullein	Devil's paintbrush	Pearly everlasting
Chicory	Purple vetch	Fireweed	Queen Anne's lace
Clover (red alsike)	Queen Anne's lace	Fleabane	White aster
Ox-eye daisy	Viper's bugloss		Yarrow
Elecampane	Yarrow		
Fireweed	Common Plantain		
<u>Woods and Fence-rows:</u>		<u>Woods and Fence-rows:</u>	
Bedstraw	Nettles	Bunchberry	Cordyalis
Bindweed	Poison Ivy	(in fruit)	Flowering raspberry
Clintonia	Snakeroot	Bush honeysuckle	Shinleaf
Herb Robert	Solomon's seal	Mayapple	Twin-flower
Jewelweed	Turtle head	Clematis	Wood sorrel
Joe Pye weed	Wild rose		
Mayapple			
<u>Ponds and Pond Edges:</u>		<u>Ponds and Pond Edges:</u>	
Arrowhead	Pond lily	Arrowhead	Pond lily
Blue flag	Water lily	Blue flag	Sheep laurel
Cattail	Touch-me-not	Cattail	Steeplebush
Pickerel weed		Pipewort	Sundew
		Pitcher plant	

Poison Ivy

Campers should know how to recognize this common plant. It is found throughout Ontario in almost all kinds of habitats. Three smooth leaflets are arranged at the end of a long stalk which can be two to ten inches in length. Each leaflet is oval with a rounded base (2" to 6" long). The edge of each leaflet may be smooth, wavy, coarsely toothed, or lobed. The colour is glossy green, but may turn brown, orange or red in the fall. It can be found in shrubby clumps or growing like a vine.

Flowers: small, greenish-white or yellowish; inconspicuous; open in June or July.

Fruits: Like clusters of tiny, wrinkled, white peas; ivory white to pale straw colour; on plant all winter.



Bodily contact with the plant is the most common method of contamination. The poisonous juices can also be transferred from clothing (especially shoes and laces), tools, paddles, baskets and other objects. Strong yellow laundry soap is recommended for washing areas of the skin suspected to have been in contact with the plant. In case of severe infection a doctor should be consulted.

Symptoms: Small blisters or swelling, redness of the skin, itching; blisters may swell and exude small droplets of clear liquid which can spread the infection.

Poison Sumach



Believed to be more poisonous than poison ivy. It is a tall shrub with smooth branches and glossy arching leaves (see drawing). Fruits—whitish, like poison ivy, but in long drooping loose clusters. The plant usually occurs in deep marshes. Prevalent in vicinity of Lake Erie.

Poison Oak

There is really no such plant in Ontario. However it is often misapplied to the shrubby variety of poison ivy.

Grasses and Sedges


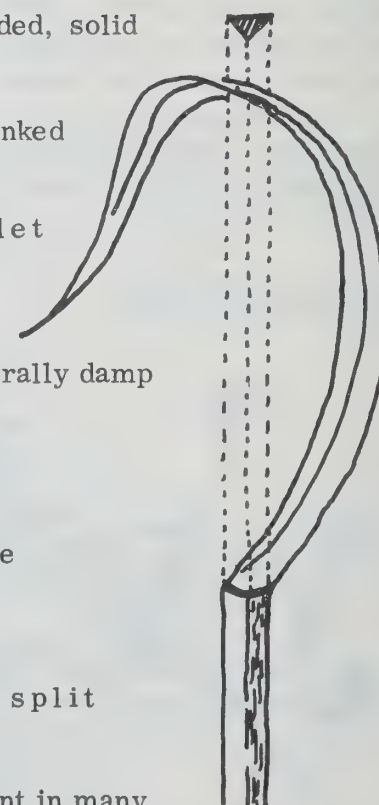
Two important groups of plants that you will certainly encounter are grasses and sedges. You will not need to know the different kinds in each of these groups but you should be able to tell representatives of one group from those of the other.

About grasses: they form a large family that includes our cultivated crops such as wheat, rye and barley—and even the bamboo that makes such good fishing poles. Two kinds of grass that you might like to recognize are timothy (of 'timothy hay' fame) and the famous Kentucky bluegrass. The chances are that both of them are common on your campsite.

The sedges form a large and complex family and some of them resemble grasses fairly closely. Although they are often found side by side with grasses, there is a general tendency for sedges to grow in damper places than grasses.

Table IV is included here to help you point up the differences between the grass and the sedge families.

TABLE IV—A Comparison between Grasses and Sedges

<u>GRASSES</u>		<u>SEDGES</u>
	cylindrical, hollow	
2-ranked	Cross-section of STEM	3-sided, solid
seed	LEAVES	3-ranked
generally dry	FRUIT	nutlet
always present	HABITAT	generally damp
split	LIGULE	none
always present	LEAF SHEATHS	not split
	NODES	absent in many

Some Uses of Plants

Children are usually keen on knowing some interesting uses of wild plants. Here is a list of uses for some of the common varieties that you might see.

Trees

Balsam — Pillows filled with balsam needles are sweet smelling. Sold to tourists by Indians. Resin used as cement in optical lenses.

Beech — The triangular thin-shelled beechnuts are fairly common in southern Ontario. They are the sweet products of the forests.

Birch — Black birch is the source of oil of wintergreen. Yellow birch makes fine furniture wood. Indians used the white birch bark for canoes and many kinds of containers. (Campers should never peel a living tree. It kills the tree. Bark may be taken from dead stumps or loose logs.)

Black Cherry — Bark extract used in medicines, e.g. cough syrup.

Hemlock — Young tips of branches with needles were used by Iroquois to make tea (contains vitamin C). This was also a favourite drink of early eastern lumbermen. Steep in boiling water. Dull red dye is made from this. The bark is important for tanning leather.

Red Maple — Source of dark blue dye in vogue among some of the early colonists. The bark is boiled.

Sugar Maple — Source of maple syrup and sugar.

Oak — An exceptionally strong, durable hardwood used for furniture, flooring and implements. Bark used in tanning leather and "galls" to make ink.

Spruce — Gum can be chewed (a lumberman's habit). Roots were used to sew birch bark canoes and to make baskets.

Wild flowers and Weeds

Arrowhead — Root ends like small potatoes in autumn. Roast or boil and peel afterwards. "Potatoes" are often several feet away from parent plant.

Bloodroot — Indians used bright orange-red juice or roots to paint bodies.

Bouncing bet — Juice of roots is soapy and gluey. Makes a substitute for soap when swished in water.

Cattail — Green flower shoots (before pollen shows) when boiled are great delicacy.

Chicory — Roots roasted and ground make good coffee substitute. Some is added to many coffees popular in Europe and with Canadians who come from Europe.

Dandelion — Young leaves washed in two waters are cooked as spinach.

Indian Cucumber — Grows in rich woods. Root stalk is crisp and starchy. Tastes like cucumber. Soak in vinegar to make pickles.

Mayapple — Fully ripe fruit good to eat. Plant found in rich woods or shady meadows. Look under umbrella-like leaves. Foliage and roots are poisonous!

Sunflower — Seeds a delectable snack. Also can be ground into a flour. Yellow dye obtained by boiling flowers.

Water Lily (white) — Flower buds were cooked and relished by the Ojibwa Indians.

Wild Onion — Bulbs sweet. Excellent in salads. Found in rich woodlands.

Wild Rose — Petals are pleasant to nibble.

Further Suggestions

When hiking, keep your eye open for wildflowers you haven't seen around camp. Jot down a description and perhaps make a quick sketch. Back at camp when you are leafing through a flower guide you might come across something that looks like your description and the extra information will be helpful.

Small flowers under the magnifying glass bring a whole new world of beauty to the campers. Suggest that the youngsters include an inexpensive one in their kits or gather up as many as you can yourself. Encourage the campers to use these little instruments on all sorts of things — mosses, insects, frog's eyes, snake's skin, etc.

Plant collections are fun to make (see the references) but a word of warning must be given in this respect. Often, in the enthusiasm of starting a plant collection, the children unfortunately denude the camp area of the less common wildflowers. Before the hike or outing the leader can point out this danger in a friendly way in a little talk about respecting the living things at camp. Specimens should always be collected wisely. Here are some hints:

- Take specimens from isolated places well off the trails or roadsides.
- If there is a clump of flowers, remove just one.
- If the plant is scarce or growing alone, don't collect it, but protect it from harm so that others can see it growing in its natural habitat. (This could work into a project).
- Do not collect specimens you are not going to use for display or teaching.

ANIMALS



ANIMALS

When you discuss animals, be sure to stress this point: all living things that are not plants are animals. There is a tendency for some people to restrict the term "animals" simply to mammals. This leads to confusion and misunderstanding because birds, frogs and insects (for example) are all animals too, just as much as cows, horses and beavers.

Animals can be divided into two large groups: those that have backbones (vertebrates—fish, frogs, mammals) and those that have no backbones (invertebrates—worms, insects, crustaceans). This is a convenient division as it stresses a basic difference in structure that is quite easily grasped by youngsters.

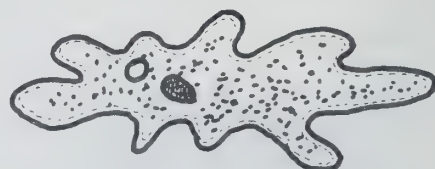
Again we will follow along in order of table II.

ANIMALS WITHOUT BACKBONES (Invertebrates)

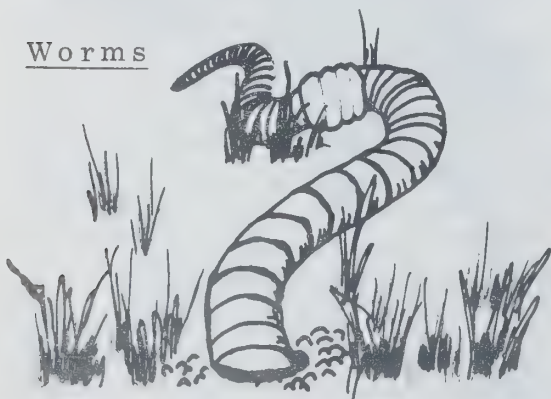
This is the group to which most animals belong. In fact, 95% of the members of the animal kingdom live without backbones.

Protozoans

These are minute animals that are commonly found in slow-moving water (ponds, puddles, ditch-water, etc.). To see them you will need a medium-powered microscope. (References 1 and 33.)



Worms



Your common examples will be the earthworm, but leeches are also members of this group.

Earthworms have been called "ploughs of God" for they are continually improving the soil. Their burrows allow air to enter the soil and facilitate drainage. Soil is swallowed below the surface in a finer form, thus the worm cultivates the earth. Leaves are often dragged underground where they are partially digested

and deposited above the ground as valuable humus in which seeds can germinate.

Earthworms are active at night (nocturnal). Even then they usually keep their hind ends in the burrow while searching for seeds, leaves and other plant material. Every segment of the worm has 4 pairs of bristles which are used for locomotion and anchorage in the burrow. At night you can experiment by gently tugging at the worms to see how well they can hang on to the sides of their burrows.

Some facts about the earthworm you might like to mention are:

They have no definite eyes.

They breathe through their skin.

Eggs enclosed in capsules which are deposited in the soil.

In tropical regions (especially in Australia) giant earthworms, 3-6 feet long, are found.

Leeches have no bristles, but they have a sucker at each end of the body. The hind sucker is usually the larger one. Most leeches suck the blood of backboned animals, but some feed on small animals such as insects. In sucking blood, the leech attaches itself with the hind sucker and makes a cut in the skin with the front sucker. Once it has had its "blood meal" the leech will not feed again for a long time for the stomach has pouches to hold enough blood to last for months.

Ontario leeches live in the water. In northern lakes and brooks the "horse leech" is fairly common. It is 2-7 inches long, dark on top and orange-red underneath. Many types of small grey leeches are common in ponds, lakes and brooks.

Molluscs

The representatives of this group that will be found in Ontario are: the water snails, land snails, slugs and clams.

Land snails make excellent nature centre pets, especially the large ones, such as White-lipped snail. They thrive on fresh lettuce and other greens. Be sure to keep the jar clean and airy. With proper care, land snails have been kept not only for the summer, but years afterward.



Many different kinds of empty snail shells make an attractive display when the shells are fastened to a cardboard with household cement. Watch for the very tiny snails in decaying logs and leaves.

Water snails are helpful in an aquarium for they eat the green algae that grows on the glass, and keep the view clear.

Slugs are snails with no protective shells. They can be found on garden or woodland plants. As they travel, they secrete their own slime road. This slime protects their bodies so well that they can pass unharmed over the edge of a razor blade. Slugs are plant eaters.

Clams in sizes ranging from the head of a pin to five inches across can be found in ponds, streams and lakes.

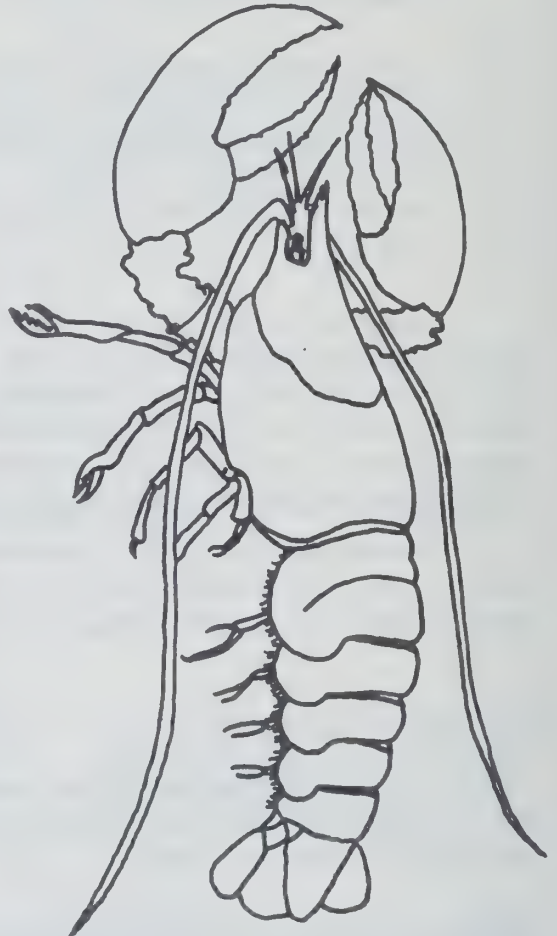
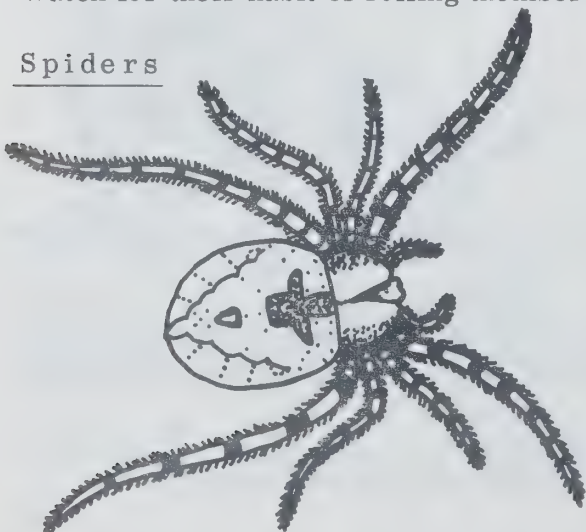
Crustaceans

Many of these are salt-water forms like the lobster, but there are fresh-water representatives such as the crayfish and even a few on land such as the sow-bugs.

Crayfish are found in slow-moving streams, in pools, and in small brooks. They make burrows underneath the edges of stones. Decayed plant and animal material as well as the odd small fish make up their diet. The chimney crayfish is one to watch for. It builds up a chimney around the entrance of its burrow. The burrows are found on the banks of streams and sometimes in wet pastures far from any stream. If you manage to get a crayfish into a pail of water, watch how this animal uses its tail to move quickly.

Sow-bugs (sometimes called wood-lice) are one of the few land crustaceans. They prefer wet habitats, so look for them in damp woods, under rocks and logs. Decaying plants are their food. Watch for their habit of rolling themselves up.

Spiders



The members of this group are often thought of as "insects". They differ from insects in having 4 pairs of legs (insects have 3 pairs) and no "feelers". Many people dislike and even fear spiders, but fear often turns to curiosity when more is learned about them.

Just sitting and watching a spider construct its web is a fascinating experience. Nature leaders should try not to miss the opportunity of having their campers watch this display of inventiveness.

Look for various types of spider webs. Early morning is the best time to go web-hunting. See how many types the campers can add as sketches to a spider-web chart. Another thing to watch for is the sequence of events that take place when an insect is caught. Set up the circumstances for these events by dropping an insect on a web.

Perhaps you have found little, soft white or yellow silken bags in old logs, under stones or on leaves. Sometimes they can be found hanging from a web or being carried around by a female spider. Carefully open them and you will find lovely round spider eggs.

Not all spiders spin webs. Some live in holes and watch for passing insects. Man should protect an animal with this worthy habit.

Centipedes and Millipedes

Centipede means "hundred-legged". Actually the common ones have about 35 pairs of legs, one pair for each body segment. Usually the legs are short and stout, but house centipedes have long legs.

In Ontario you can find these flat creatures in dark moist places such as under stones and the bark of decaying trees. It is difficult to capture a centipede for they are very rapid runners. At night they hunt for cockroaches, aphids, earth-worms and slugs.



Some tropical centipedes are over a foot long and poisonous. Ontario species are rarely longer than two inches and are quite harmless.

Millipede means "thousand-legged". Actually they have twice as many legs as the centipedes—two pairs for each body segment. Millipedes are round-bodied and slow moving. They eat decaying vegetation.

Ontario millipedes come in assorted sizes from $\frac{1}{2}$ " to 4" long. Something to watch is the beautiful movement of the legs as they travel along.

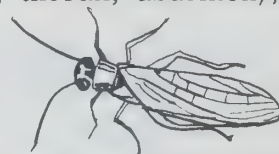
Insects

Of all the animals you are likely to encounter, by far the largest group will be the insects. There are countless thousands of different kinds of them. A marvelous source of material for study no matter where the campsite.



When insects are fully-grown adults, they differ from other animals because:

- they have six legs (three pairs);
- their bodies are divided into three regions (head, thorax, abdomen);
- they have one pair of feelers on the head;
- they commonly have one or two pairs of wings.



Insects can grow in two ways. They can hatch from the eggs looking like a small version of their parents, except that they have little stubs for wings. Then they slowly grow shedding their outer skin when they get too big for it until they have reached full size. The grasshoppers grow this way and so do bugs, walking-sticks, praying mantis, cockroaches, crickets.

The second way that insects can grow is the most exciting—from egg to caterpillar to cocoon to adult. The egg hatches and a caterpillar is born that eats (usually plants) practically all the time and sheds its skin a few times. A full grown caterpillar stops eating and starts to produce a protective jacket or cocoon in which it stays for a period of time, sometimes over winter. Inside this cocoon the adult insect develops and one day it cuts a hole and emerges. Some caterpillars are hairy, others are smooth; some are colourful and others are creamy white. There are all kinds and you can find them in rotting wood, on leaves, under rocks, in some lakes and streams, and underground. The first two places are good ones to begin looking. You may find some specimens that have not spun a hairy or papery cocoon, but have changed into a dark shiny, or white dull pupa. These types will usually wiggle if you touch them a few times.



Do keep a few caterpillars in your nature museum. Remember, always keep them supplied with the food on which you found them feeding. You will be rewarded for your care by having an insect life unfolded before you. They can be preserved in alcohol (70%) or formalin (10%) but it is much more pleasant to rear them.

Are insects important to mankind? They certainly are! There would be no fruit orchards without the bees which carry pollen to the flowers that make the fruit. Many birds and even fish count insects as a large part of their diet. On the other hand, some parts of the world have mosquitos that carry dread diseases such as malaria and yellow fever.

Some caterpillars (e.g. tent caterpillars) can be responsible for destroying hundreds of acres of trees by stripping them of their leaves.

Some common insects you are likely to find are:

<u>Meadows</u>	<u>Woods</u>	<u>Ponds & Streams</u>
Bees and wasps	Aphids	Caddisfly
Beetles (many kinds)	Beetles (many kinds)	Damselfly
Bugs	Butterflies	Dragonfly
Butterflies	Cicadas (skins often	Mayfly
Crickets	on tree trunks)	Mosquitos
Flies	Hornets	Water beetles
Gall insects	Mosquitos	Water strider
Grasshoppers	Moths	
Leafhopper	Ichneumon fly	
Spittle insects	Ants	
Ants		



Perhaps you have seen strange swellings or growths on stems or leaves of trees and weeds. Goldenrod often has large round swellings on the stem. These are the homes of various kinds of insects in their young stages. The growths are called insect galls. Cut open a few to see if the grub is inside. A collection of galls makes a good museum exhibit.

Frothy masses on plants in meadows are common. Investigate this "spittle" and you will find a green insect living inside it called a spittle bug. Occasionally a camper may find such strikingly unusual insects as a walking-stick or a praying mantis.

It is not difficult to make a good camp insect collection. Each camper can contribute to it in a small way and it makes a marvellous display for visitors. References 37 and 41 will be helpful. Here are a few ideas about making and keeping an insect collection:

1. Keep the specimens in separate sections with group headings such as "Beetles", "Butterflies and Moths". (Any unknowns can be placed under "?" for the time being. Headings describing where you found them could be used instead.)
2. If you haven't insect pins (as described in most references) use dress-makers pins, the longer the better.
3. Keep your collection in tightly closed boxes with a little jar of moth crystals inside—mice and some kinds of insects will destroy an unprotected collection.

4. Have a table where campers can deposit or prepare their specimens for the collection.
5. Encourage each contributor to place his name on the insects which he adds to the collection.

Collecting methods and equipment are dealt with in detail in Reference 37. Collected insects must be killed before they can be pinned into the box and this is the job for which the leader must be responsible because a poison must be used. You will have to be completely in charge of the killing bottles. Any senior campers that want to do some collecting on their own will have to show you that they are capable of handling a killing bottle. See Props chapter for instructions.

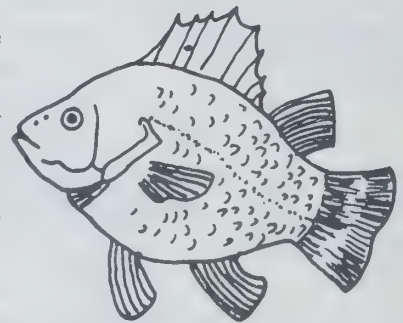
To collect moths, place a white sheet on the wall behind an outdoor lamp and examine as early as you can in the morning.

ANIMALS WITH BACKBONES (Vertebrates)

This section of the animal kingdom is the most well-known because the animals are large and conspicuous. However, of all the different kinds of animal creatures, the back-boned ones make up only 5%.

FISHES

Any youngster who has ever eaten a fish, knows that all fish have well-developed backbones. Fish are usually hard to see and study in day-time because of the reflection of light at the surface of the water. They can sometimes be seen well at night by flashlight. However, with the use of a suitable type of net, it is often possible to capture some for close study in a tank of water (aquarium). The aquarium should be set up with some care to resemble the fish's normal habitat. The usual rules and advice about keeping fish need to be observed when they are retained for any length of time. Temperature control is one of the important factors here. See Reference 48 for identification and Reference 49 for care in captivity.



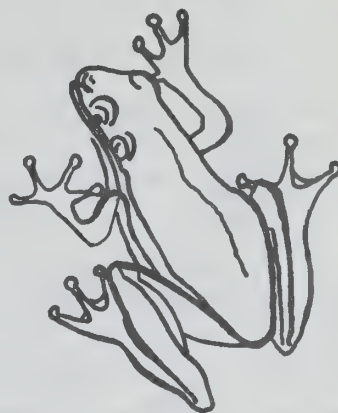
Small fish are best for captivity - various types of minnows for example. Small sunfish make good aquaria fish, and perhaps the most interesting for study are the nest-building sticklebacks. Day-camps with no stream may purchase some gold-fish or the leader could collect some small stream fish at another location.

Fish are cold-blooded. When the temperature of their surroundings changes, their body temperature changes as well.

Amphibians

Their name means that they commonly make their homes both in water and on land at various stages of their lives. The amphibians' ancestors were the first four-footed animals. This group includes the frogs, toads, and salamanders. They are cold-blooded like the fish.

The best known amphibians are frogs and toads. The tadpoles which hatch from the eggs in early spring are water dwellers and breathe with gills like the fish; the adult frogs and toads live partially on land and are air-breathers with a pair of lungs. As adults they periodically shed their old dead skin and eat it. The skin of the body splits down the back and is slipped off like a coat, while that of the limbs is pulled off inside out. We humans shed dead skin too (new skin is always being produced), but it comes off in tiny flakes. The different kinds of frogs and toads make different sounds and you can tell which is which once you know their voices.



The campers are sure to find tadpoles in the water. Use a sink strainer or just a pail or bottle as collecting equipment. Tadpoles are easily kept and managed in aquaria and their gradual development into the adult frog can be observed. Feed them boiled spinach, dead worms, pond weeds. The whole process will take too long for the ordinary camping period but tadpoles in various stages of the change can be exhibited.

Frogs and toads are highly beneficial to man. They eat insect pests in enormous quantities. Thus these animals should not be killed and their breeding places should not be destroyed or polluted. Here are some frogs and toads that you might meet in Ontario.

Tree-frogs and Tree-toads: These small amphibians ($1\frac{1}{2}$ inches) have vacuum cups at the ends of their fingers and toes by means of which they can climb trees and the inside of glass jars. There are three kinds in Ontario.

Green frog: Large (3 - 4 inches long); lakes, ponds, rivers, creeks; often bright green on hands and shoulders and brownish behind; white underneath; skin folds along each side of back; likely to be mistaken for bullfrog.

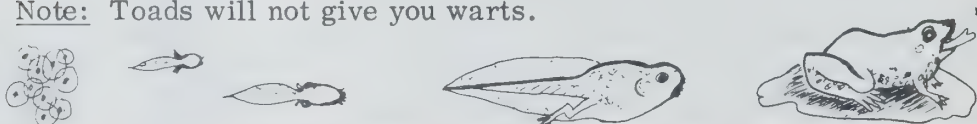
Leopard frog: About 3 - 4 inches long; ponds, marshes, weedy bays, meadows; green or brown, rounded dark spots with light edges; in captivity will take live moths, grasshoppers and other insects offered on tweezers.

Wood frog: About two inches long; old damp woods; colour variable, light or dark brown, reddish or greenish; dark line from snout to eye, light line from snout to shoulder; dark blotch behind ears.

Bullfrog: Very large (6 - 7 inches long); lakes, quiet rivers, deep ponds; green, olive to brown, blotched with darker brown, mottled white or yellow underneath; toes webbed to tip.

American toad: $2\frac{1}{2}$ - 4 inches long; farms, gardens, light woods, dry places; shades of brown, warty, mottled cream underneath, mottling especially on chest; males have high pitched trilling notes; (has a long tongue that can rapidly reach out a long way to catch an insect; at home, in terrarium, will eat small caterpillars)

Note: Toads will not give you warts.

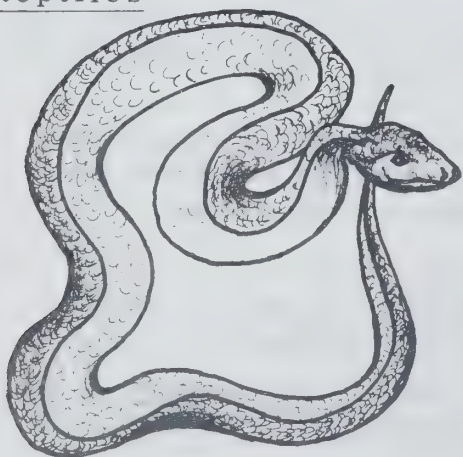


Less well known than the frogs are the amphibians called newts and salamanders—often wrongly called lizards. (Lizards are reptiles, like snakes and turtles, and have scales. Salamanders lack this scaly skin.) They have long bodies and tails. Look for their four fingers and five toes. The young hatch in the spring. Baby newts and salamanders feed upon small living animals which they swallow whole. The adults feed on small insects, spiders, snails and worms.

The slender, sometimes brightly coloured newts spend three years on land before returning to the water as adults to mate and lay eggs. The red-backed salamander has become so independent of water that it exists in old damp woods where it hides under stones or fallen logs.

Note: Larger frogs and salamanders should be grasped firmly but gently behind the front legs. Small ones can be cupped in the hands.

Reptiles



This group includes the snakes, turtles and lizards. All reptiles can easily be separated from amphibians for they have dry, scaly skin (not moist or slimy). Reptile's eggs are always laid on land.

Let's discuss the snakes first. The only poisonous snake to be found in Ontario is the rare Massasauga rattlesnake, confined almost entirely to the Georgian Bay region. Less deadly than the true rattlers of the United States, the bite of the Massasauga is rarely fatal. It is however an animal to be treated with caution.

None of the other Ontario snakes are poisonous. However almost all of them will bite in self-defence if the occasion and opportunity arise. Such bites are usually of the pin-prick variety.

The technique of proper handling is simple. The solution is to grasp the snake close behind the head and so keep the head out of biting reach. It usually helps to pin the head down first with a cleft stick to enable you to get a grip at the right place. The stick should hold the head firmly but should not be thrust at the snake so strongly as to injure it. Very small snakes can be picked up and held safely in the hand by cupping the palm.

Most children sooner or later seem to gain the impression that snakes are slimy things and should be killed on sight. You too may have that same unexplainable aversion to these animals, but this fear must never be demonstrated before your campers or they will be afraid too. When you have managed to cage a small snake (for instance a garter snake), pick up the snake, talking all the while about the proper handling methods, just as if you had done this all your life. The campers will be fascinated and you can secretly pat yourself on the back for bravery. A snake is really pleasant to touch; the scales have a dry, satiny-smooth texture. Every one can have a turn experiencing the feel of a snake. This gives the camper a first-hand chance to gain his own impression.

Snakes shed their skin in one piece. Be on the lookout for such discards.

Snakes perform a service to man because of their feeding habits. They consume great quantities of insect pests and prey on mice which are a threat to the farmers' crops. Snakes should be treated with respect and protected whenever possible. Put this knowledge into practice at camp at all times.

The list of snakes you are likely to find in Ontario is a short one.

Red-bellied snake: Small (8 - 10 inches); red or pink underneath, brownish back, yellowish spot on back of neck; eats earthworms and slugs; common in southern and south central Ontario—clearings, fields, light woods.

Northern brown snake: (Dekay's snake): 9 - 13 inches; yellowish to reddish brown with two rows of blackish spots down the back; dark downward streak on side of head, belly pale yellow-brown; eats earthworms or small slugs in captivity; common in southern Ontario.

Northern water snake: 24 - 42 inches; colour variable; dark crossbands on back and front part, blotches on rest of body; black or reddish half-moons on belly; may look plain black or brown if old one; aquatic; common in southern Ontario.

Fox snake: 36 - 54 inches; dark brown blotches on a yellowish colour, belly yellow checkered with black; common in Lake Erie and Georgian Bay regions; near water; destroys mice and rats.

Pilot Black Snake: 42 - 72 inches; plain shiny black; chin and throat cream; excellent climber, sometimes lives in hollow trees; eats mammals and birds, mainly mice.

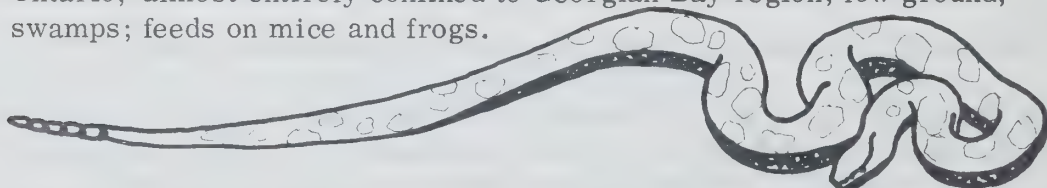
Ring-necked Snake: 10 - 15 inches; slender, dark grey-blue with golden collar, belly yellow or orange; woodlands, clearings and rocky, wooded hillsides; emits pungent odour; eats earthworms and small slugs in captivity.

Smooth green Snake: 14 - 20 inches; plain bright green above, plain white or yellowish below; gentle; fairly common in southern Ontario—meadows, light woods; eats caterpillars, grasshoppers and spiders.

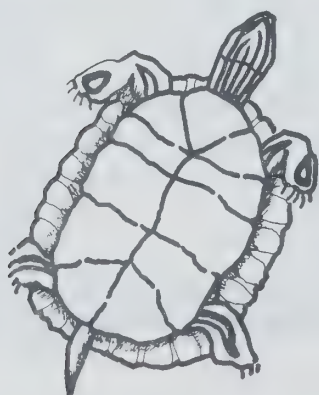
Milk Snake: 24 - 36 inches; five rows of brown blotches on grey background, a light "Y" or "V" at back of head, belly checkerboarded with black on white; victim of ridiculous belief that it milks cows; fairly common in southern Ontario; feeds mainly on mice and should be protected.

Garter snake: 18 - 26 inches; very common; usually three yellowish stripes against dark body, belly greenish or yellowish; occupies a wide variety of habitats; will eat earthworms and raw chopped fish in captivity.

Massasauga rattlesnake: 20 - 30 inches; stout bodied; large rounded spots on medium to dark background, belly black irregularly marked with white; rattle increases in size as snake grows older—a new segment is added after each shedding of skin; this is the only poisonous snake found in Ontario, almost entirely confined to Georgian Bay region; low ground, swamps; feeds on mice and frogs.



Now let's take a look at some of the turtles in Ontario. They are leisurely and long-lived reptiles. A box-turtle has been recorded as living 138 years. All are well protected by a bony shell usually overlaid with horny plates which peel off at shedding time. The body skin flakes off. They completely lack teeth. Eggs are laid on the land.



Turtles are used for food more widely than the other reptiles. The salt-water types are favourites for soup, however any fresh water turtle can be eaten. Snapping turtles are collected and sold by professional turtle trappers in North America. Fishermen often condemn turtles for eating game fish. Actually, with the possible exception of the Snapping turtle, very little harm is done in this respect. Some aquatic turtles do compete with fish for food however.

Small turtles may be picked up with the shell between the thumb and index finger. Take care not to squeeze too hard. You can pick up "snappers" by the tail safely. These fellows can bite with a quick movement and can inflict a painful injury, so don't come too close to those horny jaws.

Feed your captive turtle raw vegetables (lettuce) and some meat about three times a week.

The turtles you are most likely to see in Ontario are:

Snapping turtle: 8 - 12 inches; largest in Ontario; long tail is saw-toothed along upper side; shell small underneath, upper shell rough, brown; home in fresh water; eats a variety of plants and animals (insects, reptiles, fish); ugly disposition; unable to swallow except with its head underwater; common, widely distributed.

Painted turtle: 4 - 6 inches; large plates in straight rows across back; plates have olive edges; two yellow spots on each side of head; margin of shell red and black; eats water plants mainly; likes to bask on logs and rocks; common and easy to handle; widely distributed.

Map turtle: 7 - 11 inches; yellow spot behind eye; light olive to brown back marking like canal system laid out on chart; upper part of shell flairs above hind legs; prefers river habitat; snails, clams, and crayfish chief food; Parry Sound and Ottawa regions; difficult to catch.

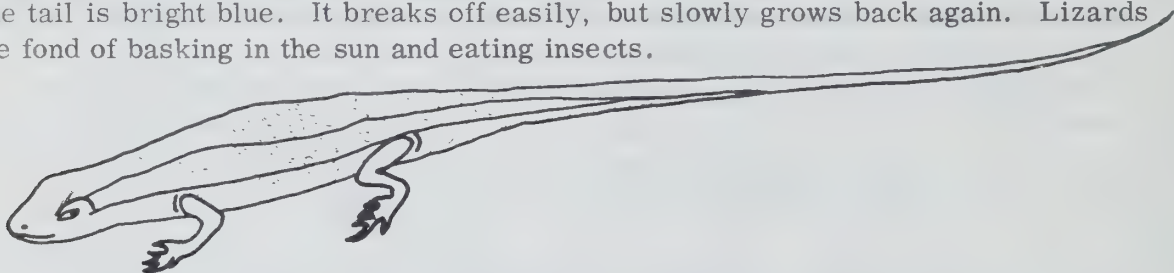
Softshell turtle: males 5 - 9 inches, females 7 - 17 inches; feet strongly streaked and spotted; form broad and flat; narrow snout; colour olive-grey to yellowish brown dark spots; shell soft, leathery; bends at sides and rear, and has no plates; aquatic.

Blanding's turtle: 5 - 8 inches; yellow on chin and throat; aquatic, around marshes and ponds; light spots scattered over dark back; southern Ontario to Lake Nipissing; eats earthworms, fish and vegetables; can swallow without submerging head.

Spotted turtle: about 4 inches; back dark brown with rounded orange spots; prefers still water; common in Lake Erie region.

Sometimes it is interesting to mark several turtles on their shells with coloured paint (just a dab will do) in order to recognize that particular one when it is seen again. A record should be kept including when the turtle was marked, what kind of mark it was, the kind of turtle, size, where it was found, etc. Leave a space for recording where and when it was seen again.

The only lizard in Ontario is the blue-tailed skink. It is found in sunny spots along the Lake Erie shore, in the Haliburton area, and the Georgian Bay region. This fellow is about six inches long, is dark olive above, with five yellowish lines. The tail is bright blue. It breaks off easily, but slowly grows back again. Lizards are fond of basking in the sun and eating insects.



Birds

This group is thought to have sprung from some reptilian ancestors and modern birds still bear on their feet reptile-like scales.



During camp season some birds will draw your attention and these can be placed in four categories - all of which may overlap to some extent.



1. Birds that are so large that their size makes them obvious: great blue heron, goose, herring gull, loon, crow.

2. Birds that are small but sufficiently colourful to attract notice: cardinal, goldfinch, Baltimore oriole.

3. Birds that attract attention by persistent singing or calling: red-eyed vireo, wood-pewee, killdeer, white-throated sparrow.



4. Birds that become familiar because you see them in the same places day after day: song sparrow, spotted sandpiper, kingfisher, swallow, house wren.

It is worth pointing out these birds to the campers whenever they may be reasonably well observed, especially when you can make some comment about where they live, what they eat, or the special way they behave. Usually the males are more brightly coloured than the females. Children often like to make up a saying that expresses the sound of a bird's call or song. For instance, the white-throated sparrow seems to be saying "sweet Canada Canada Canada", and the red-eyed vireo sings "come up in the tree and see me"; least flycatcher "che-bec"; oven bird "teacher-teacher".

There are excellent field guides for use in bird identification and you should have at least one and preferably several at camp. Become familiar with some of the birds by browsing through the pages of their pictures (See Reference 50-56). The campers might like to lean over your shoulder and point out the types they have seen around their own homes.

If you feel you need help to identify the commoner birds living around the campsite, the chances are that there are several persons in your district who will be glad to visit your area and do this for you. (See section on information sources.)

One project connected with birds that brings rewarding results is the examination of birds' nests to see how they are put together, and particularly what materials are used in their construction. It is more interesting if you know what kind of birds built the nest, but that is not essential. Dissection of the nests gives the campers an opportunity to explore the intricate construction, the engineering design and the kinds of materials used. Identification of the materials used involves interesting detective work and often produces some real surprises. Lastly, when the different materials are sorted out, set them up on a display card with appropriate labels.

Birds' nests located during trips can be marked as to location if they are still in use at the time and then collected later when the birds have left them. If the bird is still using the nest, there are a few things all good naturalists do. They never touch the nest (for the parents might desert it) and they disturb the surrounding area as little as possible (tramped ground or broken twigs make a clue for other animals that prey on birds). Make sure you add this to your campers' trail wisdom.

A collection of bird feathers that have been found also makes a good display. The campers can try to find the names of the birds which shed them.

The campers might like to know something about bird banding. This is a method of marking birds so that they may be recognized if seen again or perhaps caught or killed. Bird banding is a useful technique to learn more about the habits of migrating birds. In Ontario, bird banders must become proficient in theory and technique in order to earn a license to band.

Mammals

These are the animals to which the term "animal" is often erroneously restricted. However, as pointed out before, all living things that are not plants are animals. Mammals differ from all other animals in having hair at some stage of their lives and in suckling their young. As thus defined, we humans are mammals. Flying bats and ocean swimming whales are mammals too.

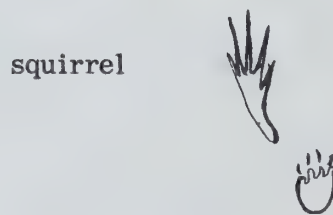
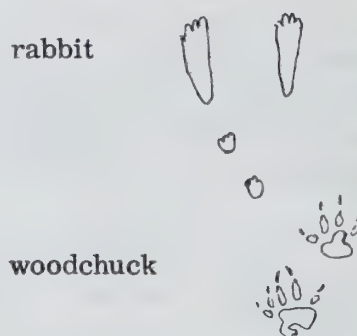
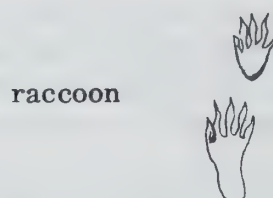
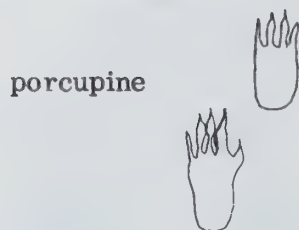
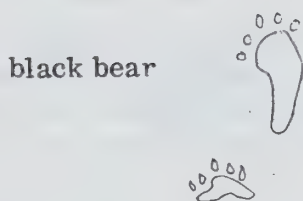
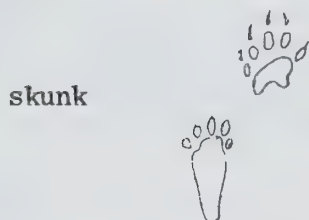


Probably quite a few different kinds of mammals live on your campsite or visit it now and then, but not all of them are active during the daytime. Some of the mammals campers can expect to see are: chipmunk, grey squirrel, groundhog, cottontail rabbit. With a little patience some of these will become tame enough to be fed by hand.

Perhaps the campers will also see: skunk, muskrat, mole, raccoon, European hare, and in the north, beaver, porcupine and snowshoe rabbit (varying hare).

One way of learning something about the mammals is by studying their tracks. Smooth out a circle on sand or a dirt roadway so that footprints will show if an animal steps into the area; then place some bait in the form of cheese, meat or grain in the centre. Leave it overnight and examine for tracks as soon as you possibly can in the morning. You may find that it has been visited by a fox, raccoon, skunk, dog, mouse or shrew. A deer or rabbit may have left prints in bounding across. There is a field guide devoted to animal tracks - References 62-64.

Animal Tracks



PROPS

The amount of equipment required to begin a nature study program need be neither inexpensive nor expensive. However, over the years, you may want to add certain pieces of special equipment such as a microscope or phonograph recordings. Equipment in the form of reference books is your most essential item. See the list of suggestions at the back of the manual.

GENERAL EQUIPMENT LIST

Many of these items you will have at camp anyway. They will prove useful in nature activities too.

Wide-mouthed jars — all sizes; for use as terraria, vivaria and aquaria; cord satchels can be made to carry the jars on pond and field trips.

Bags — paper or plastic; to carry plant material.

Tin cans — for displaying plants and making weather equipment.

Boards, boxes and crates — can always be used for making signs, animal cages, insect and rock containers, etc.

Dixie cups — make good insect cages.

Display materials — white and corrugated cardboards, scissors, poster paint, tacks, string, cellophane and masking tape, pins, nails, screws, hammer, rulers, grease pencil, glue, paint brushes, clothespins, crayons, construction paper, sandpaper, old magazines, coloured wool, saw, plasticine and so on.

Recording materials — lots of paper and pencils; scribblers (every camper should have his own nature notebook in which to write and draw).

Pail, shovel and sand — for terrarium, pond and soil studies.

Screening and old toothbrushes — for spatter paints.

Trovel — for collecting plants, looking at soil, etc.

Watering can — for erosion demonstration.

Tweezers — for picking up small specimens.

Haversacks — to carry equipment on nature walks.

Newspaper — to put between plants in press.

Cloth — old sheets, odds and ends of material.



NATURE STUDY EQUIPMENT LIST

These are the items that probably do not fit into the general camp equipment list, and must be considered for purchase separately — the more expensive ones over a period of time.

Items for observing and recording natural objects:

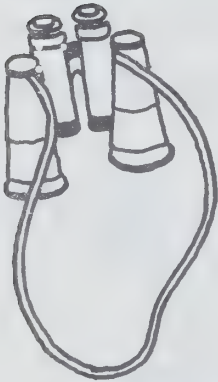


Hand Lenses

Economical hand lenses that magnify 3 to 10 times are often a great help in enabling campers to really see the flower or insect you are talking about. There should be one lens for every two campers. Make sure you get them all back after use.

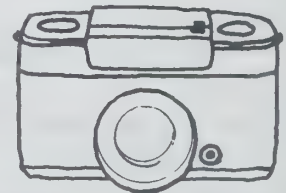
Binoculars

These are expensive but the camp leader should have one pair of 6 x 30 or 7 x 35 binoculars for use as needed.



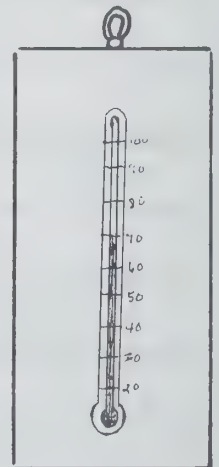
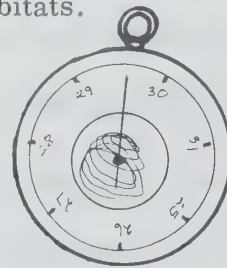
Camera

A camera is needed to record exhibits, unusual finds, ceremonies and camp habitats.



Thermometer and barometer

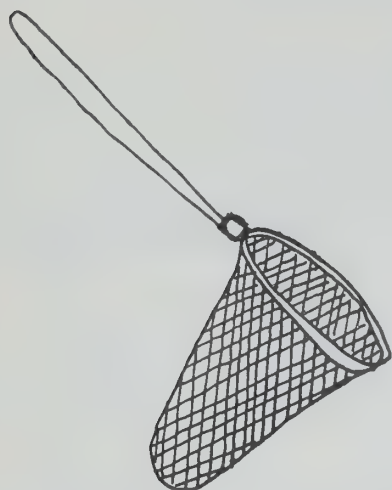
Needed for taking weather data.



Compasses

Campers should be taught to use compasses. One reasonably good compass for each six to ten campers should suffice.

For catching or collecting natural objects



insect nets

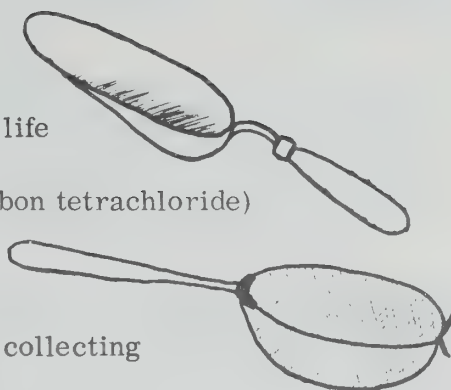
dip nets for pond life

'bug bottles' (carbon tetrachloride)

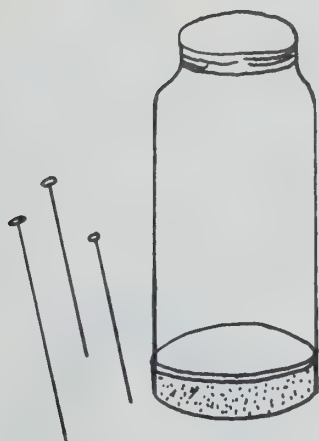
kitchen strainers

trowels for plant collecting

vasculum or paper bags for carrying plants



For preserving insects and plants



insect drying boards

insect boxes in which specimens are mounted

insect pins

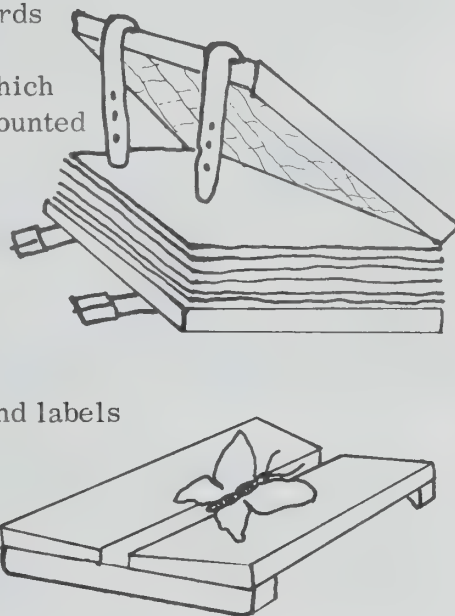
plant presses

drying blotters

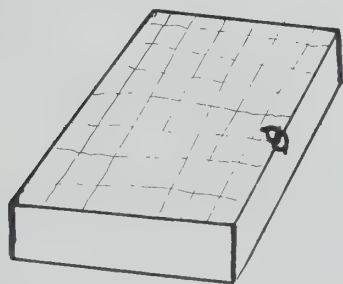
mounting paper and labels

moth crystals

balsa wood



For displaying living plants and animals



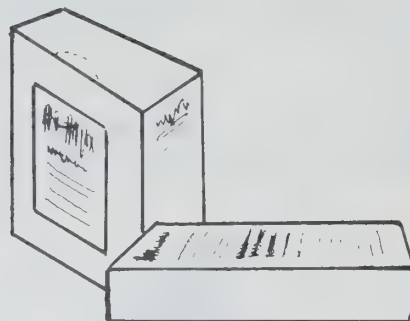
large jars (2-qt. , 3-qt. , or 1-gal.) with wide mouths for use as terraria, vivaria and aquaria

caterpillar containers

wire and wood cages made from crates and boxes

For making casts

plaster and
plasticine



For making signs for exhibits and nature trail

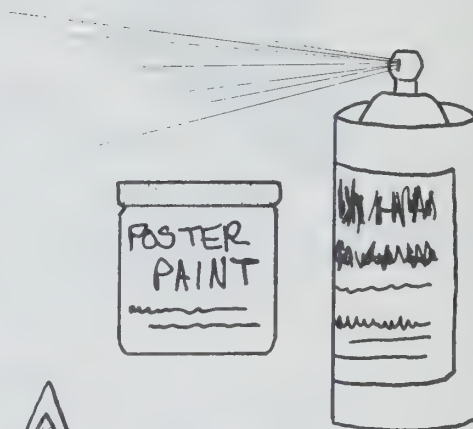
poster paints

plastic spray

clear shellac

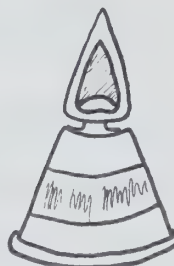
brushes

cardboard



For marking insects

nail polish

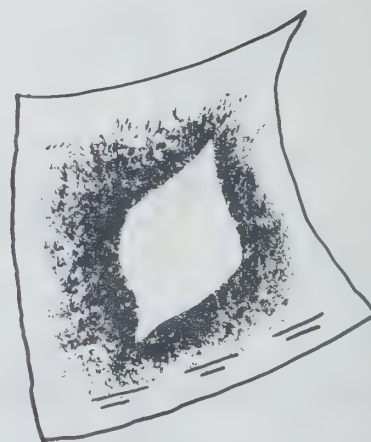


For making blueprints and spatter prints

brushes

paper and paints

blueprint paper and some
potassium bichromate



For reference books - see list at the end of this manual

Such items as terrarium containers for land life, animal cages, insect nets, plant presses, killing bottles, seining nets, nature trail signs and insect collection boxes are good projects for crafts. See that section for instructions.

Local science teachers or high school principals would be able to give you the best sources of materials for your nature study equipment.

NATURE AND THE WHOLE CAMP PROGRAM

So far you have been concentrating on finding out what is available in the way of nature resources at the campsite. You now want to think about these resources for the pleasure and benefit of the campers. Those four main objectives of the nature program should be kept in mind—to arouse curiosity, to show the concept of habitats, to show that nature is ever-changing, and how the campers affect and are affected by nature.

Above all, perhaps, the child's first contact with nature should be a pleasant one. The memory of camp natural history should be full of exciting discoveries, busy craft sessions, beginnings of interesting hobbies and the joy of accomplishment.

Nature cannot be squeezed into an hour a day. It must permeate the whole camp atmosphere. Man is dependent upon nature for his very existence and his survival depends on how well he understands the world in which he finds himself. So far he has just used things up as fast as he could, without thinking much about the shape the land will be in fifty or a hundred years from now. As the campers go through their day, let them learn that such things as food, campfire, and leather-craft all have nature as their foundation.

The best way of placing nature in the whole camp program is simply to introduce those aspects of nature which can readily be related to what the youngsters happen to be doing at the time, whether it be crafts, projects, hikes or games. Sleeping out on a clear night is a splendid time to find constellations, a rest stop on a hike provides a good opportunity to listen to the sounds of nature, while nature stories and records, or even a weather station talk, can fit nicely into a rainy day program. If nature does permeate the whole program, the campers will feel, and rightly so, that their own lives are closely woven to the natural world.

The following pages will give you a few suggestions of how natural history may be learned by "doing". You will be able to think of many variations of these themes for your camp. These activities plus your own example of profound respect for the natural world will accomplish your program objectives far more efficiently than any amount of lecturing.



CRAFTS

You can introduce nature into the crafts periods in four ways:

- by using natural material,
- by making nature study equipment,
- by using nature as a theme,
- by special "nature crafts".

Be sure that you have tested out any schemes you plan to use so that you will know how much time is needed for them. Better plan for more time than you actually think is necessary to be safe. Check that you know every step and see that all the materials needed are on hand.

1. Using Natural Material

When you and your campers gather natural material with which to work, gather wisely. Don't deface the campsite in the first rush of enthusiasm.

While your group is gathering or actually doing a craft, always try to tell them something about the particular materials that are being used (name, habitat, how to recognize, use).

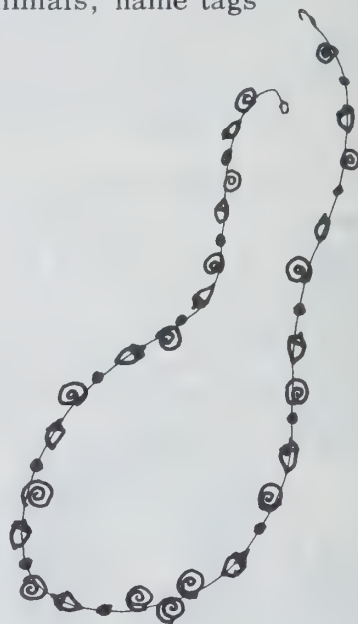
Material:

Burrs
Pine cones
Pine needles
Pebbles
Snail shells
Birch branches
Driftwood
Willow branches
Seeds
Acorns
Leaves, weeds, flowers

Reeds
Clay
Mosses
Birch bark
(from dead trees)

Crafts:

Animals, insects
Animals, jewelry — using pins, wire and paint
On nature pictures, animals, name tags
Jewelry
Jewelry
Carving, brooches
Animals
Carving, whittling
Necklaces, bracelets
Animals
Collections, prints, group tags
Weaving
Modelling
Pin cushions
Baskets, canoes, etc.



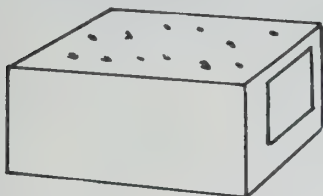
2. Making Nature Equipment

A Collecting Net

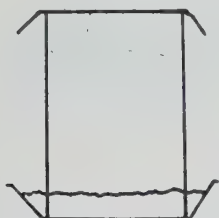


Bend coat hanger into ring 15" in diameter;
Make net bag — organdy, nylon, good cheese-cloth — 24" deep; Thread bag into ring;
Fasten ring to pole 2-3ft. long — bamboo satisfactory; Bags for catching insects should be light and transparent; bags for sweeping grass or dipping in water must be of a heavier material.

An insect cage



Small mammal cage
(temporary)



Plant press



Obtain two boards 18" by 12" and $\frac{1}{4}$ " thick or two pieces of perforated aluminium 18" by 12" (hardware store). Between these two boards place many layers of folded newspaper, and a few dozen sheets of corrugated cardboard and blotters. Strap the two boards together with two old leather belts (or rope). Place plants between in the layers of newspaper or blotters, strap press tightly and keep in dry warm spot; change papers when they become moist. (If plant too large for sheet, fold it in zig-zag position.) In about four days, the plants should be ready to mount with gummed tape or glue on white sheets of strong paper. Place a label on the lower right of the sheet and include date collected, collector's name, habitat and plant's name (if known).

Nature trail signs



Cut windows in sides of plastic or cardboard food containers. Cover window openings on outside with cellophane. Punch small holes in lid. Different size bottles with tiny holes punched in lids or with screen windows in lids also satisfactory.

Bend piece of galvanized screening so that resulting circle is about one foot high and the diameter is that of the bottom of a tin pie plate. Fasten the edges with fine wire. Pour deep layer of plaster into bottom of pie plate and set in screening. Let plaster set. Use second pie tin inverted for lid. Fasten to cage with wire.

Large tags 3" x 6" (aluminium, heavy cardboard) attached to twigs or a stake placed in front of subject. A wooden sign nailed to a stake that is driven in the ground (these can be used from year to year).

Never nail a sign into a living tree.

Suggested lettering materials:

For aluminium — black or coloured enamel, or one on the other.

For cardboard — India ink, grease pencil; spray with plastic.

For wood — enamel; give two coats of shellac.

Lettering should be large enough to read from path of trail.

What to label

Trees, ferns, wildflowers, habitats, geological formations, cicada skins, bracket fungus, a natural curiosity, beginning of erosion, animal holes, ant nests, etc.

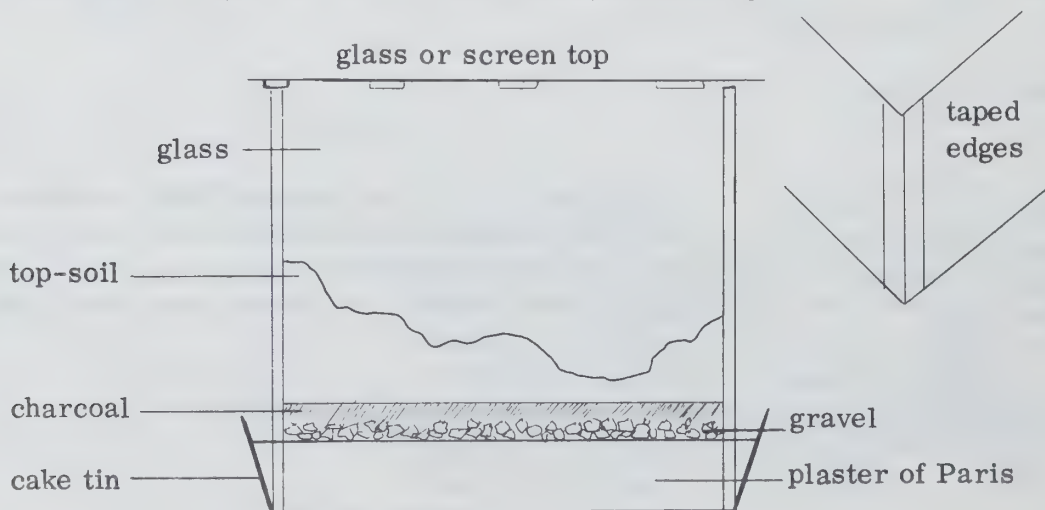
What to include on labels

Name, rhymes, plus some interesting data about subject (smell, taste, use, clue to identification).

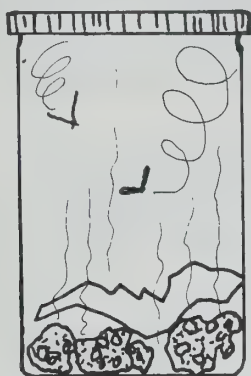
Make the signs humorous and change them often.

Terrarium

A rectangular cake tin will serve as a base. Have five pieces of glass cut to fit in bottom of tin and form sides of terrarium. One piece could also be cut for top. Pour thick layer of plaster of Paris in bottom of tin and set in glass sides and ends which have been taped so that they fit together. Glass could be greased at bottom so that it can be removed at a later date. Tape the four corners more permanently.



Insect killing bottle
(the leader's personal craft!)



Soak rubber pieces (bands, sponge) in cleaning solution, carbon tetrachloride, overnight in a tightly capped jar. Remove swollen pieces and place them in whatever sized bottle you require (small coffee jar is handy size). Cover layer of rubber with some crinkled plain paper or paper towelling. Cap tightly.

The rubber should be resoaked about every five days.

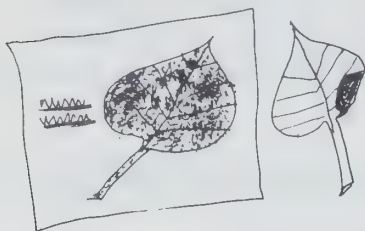
Important: Avoid inhaling the fumes of carbon tetrachloride. It is a poison that accumulates!

3. Nature as a Theme

- | | |
|------------------------------|---|
| Plasticine models | Subjects such as an insect's leg, duck's leg with band, erosion, salamander, or underside of a fern frond can be attempted. |
| Balsam pillows or satchels | Fill small brightly coloured pillow-case (any size) with balsam needles. In this way the campers can bring the fragrance of camp home with them. |
| Drawing, painting, sketching | Subjects could be the favourite animals, habitats, flowers, toadstools, etc. Outside is the best location to work. Make it a nature artists' excursion. |
| Carving | Natural objects carved from potatoes or carrots. |
| Name tags | For party or group expeditions. Birch bark fish with name in grease pencil, large burr with paper tag glued to one side, leaf cutouts, card with name printed in short pine, spruce, balsam or hemlock needles, fastened with glue. |
| Signs for camp | Give them a natural history twist ("Peeper Pool", "Tree-toad Tuck Shop", "Cicada Circle"). Decorate them with animal and plant pictures; construct the letters by nailing twigs on a board. Birch bark letters glued to a black background produce a striking effect. |
| Camp prizes | Your imagination can be your guide.
You might also use nature as a theme for making masks and mobiles for campsite murals and paper sculpture, and even for a costume party. |

4. Special Nature Crafts

Leaf prints



Pin pressed leaves on drawing paper. Spatter paint on paper using toothbrush and scrapper or screen. Remove leaves when ink is completely dry.

For leaf blueprints see Reference 30.

For ink prints, apply printer's ink with roller to back of dried leaf. Press print on white paper.

Spore prints

See fungus section, page 21.

Bird house

See Reference 53.

Feeding tray

See Reference 72.

Animal tracks

See references 62 or 63 for plaster casts.

Charts

Showing such things as different maple or oak leaves, a food chain, life of a tadpole, etc.

Animal homes

Try to construct bird nests, spider webs, chipmunk holes — from string, paper bits, plasticine, etc.

Nature map

Illustrate a simple map of the nature trail, campsite, shore, etc. Could even be a nature treasure map.

Miniature garden

Arrange the tiny plants on your campsite — cut grass, lichens, mosses, club mosses, flowers, in pie-plate gardens. Use of pools and pebbles will also contribute to the effect.

Soil profile

Build a miniature soil profile in a straight sided glass jar and label layers.

When a soil profile has been dug, it might be fun to try a "sputogram". Measure the depth of each layer. On a sheet of paper mark off these layers by indicating what the layer is and how deep it is. Now wet the thumb and pick up some soil from the first layer. Rub it in the humus layer section of your chart. Repeat for the other layers. Each "sputogram" will be a different colour of brown representing the layers in the soil profile.

PROJECTS

These are the kind of things that the campers can work on from time to time either individually or collectively. Some work can be done one day and then picked up another time until the project is completed or the results can be seen. Perhaps you will like to assign different projects to different groups or let the campers choose their own.

The leader's own special project will be organizing some sort of a nature centre and then guiding its furnishing and upkeep by the campers themselves. It can take many different forms from the portable day-camp kind (with collapsible work benches, an orange crate museum and library, a clothesline for displaying crafts and hanging pamphlets, and a large sheet of "ten-test" for tacking) to a tent or even part of a room with permanent tables and chairs, bulletin boards, bookshelves and space to store equipment.

Every nature centre should have the best possible reference library that the camp can afford. Be sure to take advantage of the inexpensive and free publications as soon as you can. (See list at back of the manual.)

The campers themselves can furnish their nature centre with results of crafts, pictures, cartoons, aerial maps, topographic maps, material from hikes, collections, and such. By the end of the summer, or the end of one camp period, the centre should be one of the most interesting spots to visit, for the camper can look over his own accomplishments and see what the other children have been finding and doing as well. Arrangements can also be made to hold a display of the nature art and craft projects completed.

Here are some projects for consideration in your program.

1. Dissection of bird's nest

Page 49 of this manual gives some details.

2. Weather office

See page 16 of the manual.

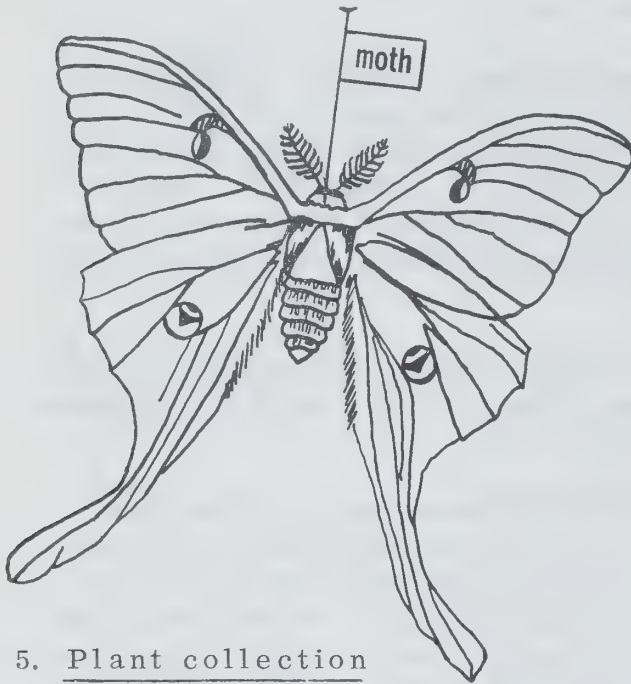
3. Individual nature scrapbooks or notebooks

Some instruction can be given as to the form of the book.

4. Insect collection

References on insects, especially Reference 37, will be helpful.

The insect must be killed (see directions for preparing a killing bottle) and then pinned almost immediately afterwards behind the head. The legs, wings, and feelers can be arranged using a pair of tweezers. Moth and butterfly wings must be spread on a spreading board and left to dry.



Each insect should have a little tag pinned under the body giving the date, place of collection and the collector's name.

Your specimens do not have to be named in the collection. It is better to place them in sections headed beetles, moths, and butterflies, wasps, dragonflies, bees, bugs, etc. You could also arrange the insects under such headings as field insects, woodland insects, stream insects, etc., thus using the habitat as the basis for your classification.

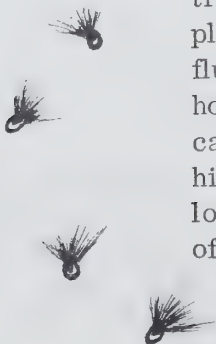
5. Plant collection

The nature activities' references will guide you in this project. Each separate plant must be first pressed (see directions for constructing a plant press on page 57) and then mounted on a sheet of cardboard with tape or glue. The date and place it was collected plus the name of the plant (if you know it) should be printed at the bottom. Perhaps each card could then be covered with cellophane and either hung on the wall of the nature centre or filed in a box under the colour of the flower.

6. Mineral collection See References 3 and 6.

7. Seed collection

See how many kinds you can find. Coniferous and broad-leaved trees, and wildflowers all will be shedding their seeds and each plant will distribute them in its own way. Milkweed seed has a fluffy parachute, the maple seed has wings, the burdock seed has hooks, and so on. Each seed could be affixed to a stiff sheet of cardboard and nicknamed by the camper — the burr is "hitch-hiker", jewel-weed seed is "jet-propelled". Leave room for lots more. The collection should be quite impressive by the end of the summer.



8. Discards

Feathers, cast skins of insects and snakes, nests and the like can be placed in a curio box. Each item should have some information on a tag attached to it (collector, animal it came from, story behind it, etc.).

9. Skeletons

Turtle shells, mammal bones, snail shells, etc.

10. Nature trail



A nature trail is really an extension of the nature museum idea into the out-of-doors. You select a portion of the campsite as your exhibit area and then you mark a trail through this area using decorative and eye-catching signs to point out the objects of interest (see page 57).

As with the nature centre, the fun is in doing the arranging of the trail and preparing of the signs. However the leader must be the guide and adviser.

Choose a site that has a variety of surroundings so that the trail will lead from one habitat to another. To avoid repetition, or the re-tracing of steps, the trail should follow a more or less circular route ending up at or close to the beginning. Detours or blind trails off the main route to a point of interest should be kept in mind too.

The trail should not be long — a quarter to a half mile, or even less, is often long enough. If the area and route are carefully chosen you will have ample material within that distance.

A nature trail is never finished. It needs to be maintained throughout the season. Seasonal changes in the habitats of animals and in the appearance of new plants require changes in your signs and exhibits.

The trail will be a help to the leader in getting across some ideas through practical application: respect for living things, wise collecting, the diversity and profusion of nature, habitats.

11. Aquaria



An aquarium is really just a water cage. In it you can keep small plants and animals obtained with a dip net from a pond or stream — small fish, water insects, tadpoles, snails, and water plants.

It is better to have several small aquaria rather than a single large one. Glass jars ranging from one quart to one gallon size make good containers. Do not crowd the animals. If you mix flesh-eating (carnivorous) and vegetarian kinds, you are likely to end up with only one kind. But even when this happens, you learn something about the habits of these animals.

Keep the aquaria near the window, but not in direct sunlight. Try to disturb the container as little as possible.

12. Terraria

A terrarium is really just a cage. In it you can keep small animals, frogs, toads, snakes, caterpillars, beetles and other insects. You can have special terraria for plants, or mix plants and animals together. The terrarium described in "props", or a large glass jar will do.

In any case a small portion of the animal's or plant's habitat should be re-created in the terrarium.

Basic plant terrarium: Place one inch of clean pebbles on bottom, then a quarter inch of charcoal chips (to help keep soil sweet). Now add the soil in which you wish to plant, and perhaps some leaf mould. Leaves should not touch the glass. Suggested plants — maple seedlings, wintergreen, mosses, club-mosses, lichens, Christmas fern, etc. Animals will drink water sprinkled on plants. Keep in cool, light place and adjust the cover to let air circulate.

Semi-aquatic terrarium: Water-loving turtles, newts, frogs, like the choice of wet and dry surroundings. Sink a pond in the centre (a low glass dish) and provide gravel or wooden ramps to land. In the case of a jar, pile up a pebble beach at one side.

Snake terrarium: Snakes and some toads and turtles burrow, so they are best kept on bare pebbles or papers with a shelter and a water dish large enough for the snake to submerge. Make a tight-fitting lid of screening tacked on a wooden frame.

13. Dandelion dig

Best done after a rain. See who can get the longest unbroken root. Ask one camper to fill holes with pail of earth, another to sprinkle grass seed, Leader should interject information about dandelions, other weeds, seed dispersal, etc.

14. Growth

Kidney beans on a wet rag in a capped jam jar will sprout quickly. Their growth can be followed from day to day. Perhaps you could set up a jar every day so that the whole process can be seen in different stages.

15. Field studies

This type of project might appeal to the older campers who often prefer to work in small groups. When their field work is completed, the results could be posted as a special display or the campers could give reports at a special "nature conference".

Some suggestions for simple field projects:

- Compare the numbers and kinds of plants in a square yard of three habitats, e.g. field, wood, marsh.
- Describe part of the life history of an insect observed at camp, e.g. milkweed caterpillar, changing into chrysalis, moth emerging from cocoon, growth of a tadpole.



- Describe the behaviour of one animal found at camp — its eating and sleeping habits, its family life, nests, sound could be included. Squirrels, chipmunks, nesting birds and ants are good study subjects.
- Set out a bird bath in a fairly undisturbed area. Count number and kinds of birds which visit it. Describe how they "take a bath", or drink.
- Set up a group of terraria each illustrating a different kind of habitat, e. g. field, rocky slope.
- Find out everything you can about a plant or animal in which you are particularly interested. This study will combine reference reading with field observations.
- Prepare a list and construct a display of animal signs found at camp, e.g. owl pellets, rabbit droppings, foot prints, nests, holes in the ground, cast skins, etc. Perhaps some of the signs found will remain mysteries.

16. Care of animals

Disturb and handle the animals in your nature centre as little as possible. If an animal is doing poorly in captivity, release it. Have the campers gather to witness the release of the animal into his own habitat. Your actions will serve as an example of respect for wild creatures. It is much better to take good care of a few animals, than to have a packed zoo of dying creatures for the children to watch.

A good practice is to house animals temporarily and then return them to their habitats when they have been examined by the campers. The duties involved in taking care of the live animal exhibits should be clearly understood by all the campers to whom you delegate that responsibility. If the duties are not carried out, the animal should be released.

A good live exhibit will contain animals that seem reasonably content in their new surroundings. The key to success is, in fact, to duplicate as far as possible the conditions under which the animals normally live. The soil, water and plants in their new homes should be those to which they are accustomed. Do not crowd too many animals into one container. As a general rule, keep different kinds of animals in separate containers. Refer to the literature for some suggestions as to the right kind of food supply. The chances are that you can find suitable food at the place where you found the animal.

Two factors that are most important when keeping live animals or plants are temperature and moisture. Very few animals can withstand the extremes of temperature and humidity that humans can.

You can reduce humidity in containers by punching holes in the lids or making special screen tops.



Temperature control is a more difficult task. See that direct sunlight does not fall on glass containers for more than a few minutes at a time. If the animals are retained overnight, try to avoid a drop in air temperature in the cages by placing them in some sheltered location. Metal containers are poor because they lose heat quickly. Wooden containers are better. Some animals, such as mice, can insulate themselves from the cold by making nests of cotton batting or other materials you provide for the purpose.

Note:

Field studies should not be compulsory; they should be assigned only to those campers who express a sincere wish to do some extra work in nature study. The leader should limit the scope of the assignment so that the camper will have a good chance of completing it in the time allotted. If the problem assigned is too difficult or lengthy, it will probably be abandoned part way through by a very discouraged youngster. Discuss with the camper what is expected of him, give him the tools required, and encourage his work whenever you can. His report or display should be examined carefully and commented upon by the leader. There is a great sense of achievement for the camper who takes part in a field study.

SPECIAL PROGRAMS

These are "something to look forward to" programs which can take the form of trips or non-routine activities at camp. Each camp must take advantage of the resources in its own vicinity. The following are some suggestions for special programs.

1. Trip to visit a bee-keeper

In this case, as in all similar cases, arrangements should be made personally well in advance and then confirmed a few days before the actual excursion. Your host will want to know exactly what kind of information and demonstrations the children would enjoy. The campers should be briefed regarding the importance of the man's property. Their behaviour will determine whether or not the trip will be repeated next year or with another group of children.

2. Trip to a nearby farm

Contour ploughing, construction of wells, soil conditioning, planting, care of animals, and other farming methods could be investigated during such a trip.



3. Trip to a bog or a swamp

Leader should acquaint himself thoroughly with the area to be visited and inform several other leaders of his plans for the day. Only small groups should be taken (six to seven), if only one leader is available.

4. Early morning nature walk and cookout

After insuring that all the necessary supplies are packed, let the campers be responsible for cooking and serving breakfast. They can even plan their own menu (within limits). Sometimes it is advisable to drop some supplies at your eating spot before the trip (water, pans, wood).

5. Visiting naturalist

Discuss the program with your guest in advance. Chances are that he will appreciate your telling him about the group and the approaches you think are most successful with them. Your experience with young minds and his knowledge of nature will have to be combined in order to ensure that the youngsters will enjoy themselves and learn at the same time.

6. Movies and Records

See references at back of this manual.

7. Trip to a mine or quarry

Talk about economic values, tell the geological story, hunt for fossils, etc.

8. Trip to a municipal water purification plant

9. Trip to a greenhouse

Collect some seeds for planting and learn about transplanting, temperature, humidity, etc.

10. Nature stories

Fun for a rainy day (see selection at back of manual).

11. Drama night

Pantomime to words of a nature story; animal shadows behind back-lit sheet; small skits on a natural history theme, such as the four seasons, a food chain, the tale of a tadpole, etc. Perhaps costumes could be made in crafts from newspaper, reeds, flowers, and other materials.

HIKES

Natural history is more easily taught out-of-doors than out of books. When habitats, conservation measures, and other concepts are pointed out in the field, the picture and idea tend to stick with the camper. The camper is given an opportunity to take a close look at the countryside—at first through your eyes as a story teller, and then through his own.

Too many children believe that the woods and their inhabitants are "scary". Fear is usually dispelled when the child becomes acquainted with this habitat. You, the leader, will have to make the introductions, and help the children feel at home in nature.

Although the best hikes often seem to be casual rambles, they are usually carefully planned. A "prospecting trip" a day before is helpful in order to locate points of interest. The length of the hike should be governed by the energy of those participating. The physical exhaustion of the campers is no measure of the success of hikes. Short trips are best with frequent rest stops along the way. The interesting places you found in your preliminary survey may serve as rest spots. The rest stop can be used to talk about some conservation principles or other topic, or play a quiet nature game.



The size of the group taking part in a hike is an important consideration. A large group tends to straggle making it difficult for you to keep proper control. When you stop to talk about some particular object, the chances are that only five or six campers can see or hear properly. The others tend to become bored or distracted. Thus groups of not more than five or six are about right for hiking and ten should be considered the limit.

When you have more than ten campers taking part in a hike, form two or more small groups, each under the charge of a leader. If your leaders are mature and competent, the groups can operate independently. When leaders are scarce, it is sometimes possible to appoint assistant leaders from the group itself. Each assistant can take charge of a small group. The groups should be close enough to one another to permit general supervision and yet far enough apart to operate as distinct units. In this way the leader-in-chief can spend some time with each group.

It is well worth the trouble to give temporary leaders some coaching about the proposed route and what to look for along the way.

When you do stop to explain something, have your campers around you in horseshoe formation. Wait until everyone is in the horseshoe before you begin. Always stay at the head of the line and assign an assistant to bring up the rear.

It is not necessary to carry on a running commentary about everything you see. But as you proceed between the selected stops, your eyes and ears will catch some spontaneous glimpses of nature's true-life play in action that often are the highlights of a successful hike. Sometimes the action is too fleeting or too distant for all the children to see it properly. In those cases you are probably justified in ignoring it in order to spare the campers a feeling of confusion, frustration and disappointment. The events that make the greatest impression are those that the whole group can see and discuss.

Here are a few techniques that may prove helpful during a hike:

- Encourage members of your group to tell some of their own experiences and listen (rest stop).
- Have a collection of human interest stories 'up your sleeve'. These can be collected from your readings or friends and naturalists — funny camping stories, economic use of plants, old superstitions about snakes, etc.
- Begin with simple things — the commonplace objects that the camper has often seen but knows little about. Keep the number of things you explain down to a minimum to avoid confusion.
- Delegate some of the carrying duties to various assistants, but keep their loads light.

- ◆ Walk slowly and quietly on hikes.
- ◆ Sit down every once in a while and listen to the sounds of nature.
- ◆ At first ask questions that are sure to be answered. This will build up the children's confidence. They find out that they know more than they thought they did.
- ◆ Attempt to imitate the bird song you hear. Amusing versions will result and the song won't be easily forgotten.
- ◆ In handling animals, keep the interest on the animal, not on the child. Instead of 'he won't hurt you', say 'I wonder if he lives near here', or 'see how quiet he is when stroked under the chin'.
- ◆ Allow some time for each camper to explore on his own. This might be done after lunch and clean-up.
- ◆ Allow some 'follow-up' time after a hike in order to prepare collected material and look up items in the nature library.

NATURE GAMES

Nature games are useful as a form of recreation in which facts and relationships are learned with a minimum of conscious effort. You should keep certain ideas in mind when selecting and carrying out the games: use familiar names and objects, fit the game to the occasion, state directions clearly at the beginning, have the campers' nature knowledge as a basis, and choose games that are fun to play.

In your program you will probably need two types of games: those that are best played on a hike or on a trail, and those suitable for quiet periods. You will be able to think of many variations on those suggested here and to adapt some other familiar and time-honoured children's games, using nature facts as a basis.

Trail or Active Games

LEAF TEAMS

Teams are given a limited time (10 or 15 minutes) to hunt for leaves from as many different trees as possible. Only one leaf of each kind should be accepted and each must be identified. Perhaps one member of each team might be given the duty of writing out identification slips and attaching the leaves with pins or sticky tape, or they might be simply weighted down with stones to keep the wind from blowing them about. The largest collection, correctly identified, wins.

SCAVENGER HUNT

Invent some story about asking an old Indian 'medicine man' to make you up one of his famous potions or charms. You might say he is too old and feeble to go out and hunt for the things he needs for his recipe, but that he has promised to make it for you if you collect the material. Then give each team a list of the items in the recipe, 10 to 20 items depending on the amount of time you have for the game. They might be things like a half-dozen flies, ten hemlock needles, a frog or toad, twelve milkweed seeds, three caterpillars or worms, a bit of spider web or animal fur, and so on. Set a time limit. The team with the largest number of the items wins.

TREASURE HUNT

Just as when this game is played in the city, each team is given sealed instructions to begin with and picks up the clues as it goes along. The first note might direct the teams to 'face the rising sun and go to the tallest maple tree to be seen'. At the tree there might be instructions to 'take your direction from the lowest branch of this maple tree and go to the large lichen-covered boulder'. There the route might be marked with signs scratched on the ground, and lead to a flat stone under which there might be a message directing the players to 'follow the stream to the clump of cat-tails'. Another message might be on a cat-tail stem and so on until the treasure is located — a box containing an 'apple blossom' biscuit for each member of the winning team perhaps.

I SPY

List the things the children may see along the trail and allot points for each — the more unlikely the item, the more points. For example: a crow in flight 5, a live toad or snake 15, a frog 10, caterpillars, moths or butterflies common in the district 5, a squirrel or chipmunk 5. The first one in the group to see one of the items, and call out 'I spy so-and-so' scores the appropriate number of points.

NATURE MUSIC

See that the children have pencils and paper. Ask them to sit or stand perfectly still for 2 or 3 minutes on an agreed signal from you, and to listen with all their might, writing down every sound they can identify — whisperings of pine needles, songs of birds, buzzing of mosquitoes, or chirping of crickets. The one with the longest list wins. You must be close to the children and listen carefully to check their lists.

MEMORY COLLECTION — I

Show the children a display of about 25 nature items — flowers, insects, leaves, or whatever materials are common in the area. Let them study it for just a minute or two and ask them to try to make another exhibit exactly like it. They might work in teams. The teams might be given 5 points for each correct item and lose 5 points for each wrong one.

Games for Quiet Periods

MEMORY COLLECTION - II

When this game is used for quiet periods the children can be asked to write down the items in the collection instead of hunting for duplicate items. Arrange the collection on a table and cover it with papers. Lift the papers to let the players study the items for a minute or two; then cover the table again. The team managing to write down the most nearly correct list wins.

FOOD-CHAIN GAME

Players are divided into two or more teams. The first player from each team writes on a blackboard or notepaper tablet the name of an animal. The second player adds to the list the name of an animal that is known to feed on the first animal. The third player adds the name of an animal that eats the second animal, and so on. The team that has the longest list at the end of a given period of time wins. Lists go something like this: beetle, frog, snake, horned owl, mosquito, fish, merganser duck, fox, black fly, dragonfly, crested flycatcher, red squirrel, and so on.

SCRAMBLED NAMES

Give to each team a list of scrambled names of trees or birds or flowers, such as: 1.mabsal 2.yikroch 3.kramacat 4.woirdono 5.lilwow. The first team to bring in a correctly unscrambled list wins. 1. balsam 2.hickory 3.tamarack 4.ironwood 5.willow.

TRUE OR FALSE

Read aloud to the players a list of statements, some true, others false. Examples: Spiders are insects. Poison ivy has leaves in groups of three. All animals have four legs. Ferns have no flowers. Snakes are slimy. Elm is a hardwood. Toads cause warts. Make up your own statements according to the age and experience of the children. The child who is first to call out correctly 'true' or 'false' to each statement scores. Perhaps it might be more orderly if the children answered in turn.

ANIMAL, VEGETABLE OR MINERAL

This familiar game (sometimes called 'twenty questions') can be played with nature subjects. The number of questions allowed may be limited to 20 or some other number. The 'mineral' category does not have as many possibilities for nature subjects as the other two. You might even change the name to 'animal and plant'. Then a 'plant' subject might be a certain evergreen tree. Is it a flowering plant? No. A fern? No. Larger than a fern? Yes. A tree? Yes. With scale-like leaves? No. With needle-like leaves? Yes. And so on until the conifer is identified by the winner.

WHO AM I ?

Even this well-known game can be played with nature subjects. Each player wears the name of a plant or animal on a small sign pinned to his clothes at the back so he cannot see it himself. He must try to find out who he is by asking the others questions to which the answers 'yes', 'no', or 'I don't know' can be given. The first player to discover the name on his sign wins.

NATURE CHARADES

Each member of each team picks a paper slip prepared previously by the counsellor. Each person of each team must act out object named on paper, to his own team until they guess. Team that finishes first wins. Suggested objects: weeping willow, red-bellied snake, cricket, crow, etc.

EARTH, AIR, WATER

One person is IT. He points his finger at one of the campers in the circle and says either earth, air or water. The camper who has been pointed to must name an animal, bird or fish before IT reaches ten. If the camper does not succeed in doing so, he becomes IT and so on.

NATURE ALPHABET

The leader names a letter of the alphabet. Each player in order names a bird, flower or tree (decided on before starting) beginning with that letter. Anyone who cannot do so within a specified time (5 seconds) loses a point. No one is to name an object which has been named before. The person who has lost the fewest points at the end of a certain time is the winner.

PLOTS AND STORIES

Now we come to the 'story-line', as the movie people call it. The facts the children observe on hikes or nature trails need to be given a type of framework or plot to connect them and relate them to the objectives of your program.

Your story topics will depend on the available nature resources and on the interests of the children. You cannot expect campers to be enthusiastic about something they can't actually see. If the group as a whole is curious about wild-flowers, you will have a hard time diverting their interest to rocks. As you talk about the things about which they already know a little and in which they are interested, you will have many chances to refer, in passing, to interesting facts about other divisions of the natural world. Soon the children's interests will broaden and they will show curiosity about some of the less obvious forms of life.

The stories given here are intended to serve as guides for developing your own collection. They are not to be memorized word for word. Those used here will probably need some modification to fit your own particular campsite. They should be employed at a suitable time, i.e. the old stump story is told on the occasion of finding a decaying stump. The story would have little meaning for children without the actual subject before them.

This manual has dealt with the scope of nature study in a certain order of sequence that may be helpful when you come to draw the whole picture together at the end of the camping period. But it is certainly not necessary to follow this sequence when you are presenting the subject. Don't be afraid to jump in at any place along the line that seems to be appropriate for what is at hand. Keep the children interested and the broad outlines will gradually come to them. These plots and stories are designed to help bring the outlines into understandable form.



STORIES ON PLANT SUCCESSION

'Dry' Succession

On this boulder (or rock out-crop) you can see that there are some very small, flat, green, and grey plants growing. These are called lichens and they are particularly interesting because they can grow on bare rock where other plants cannot grow. They are also interesting because they are examples of the first stages of a series of events, taking a long, long time, that must take place before a big forest of tall trees can grow.

These lichens are able to live on water and sunlight and certain very small amounts of chemicals they are able to extract from the rock. As the lichens live and die, their remains gradually add up to form little bits of soil that mingle with tiny bits of rock broken up by wind and rain and frost and by the action of the plants.

After a while, there comes a time when enough soil has been created so that mosses can grow here — as you can see has happened on this spot over here. Many generations of mosses live and die in turn and their remains gradually form quite a thick pad of soil that eventually is able to support some of the hardiest kinds of grasses.

Soon, as you can see here, other grasses and sedges take over and they make a still thicker layer of nourishing top-soil.

In this part of the country, where the climate is best suited for the growth of forests, rather than grasses, other plants are then able to take over from the grasses and sedges. Young trees come up from seed and such trees as poplar, hawthorn and cherry spring up, soon cutting out the sunlight from the smaller plants. That is the sort of thing that is going on right now over there where those young poplars are.

Eventually those trees, in turn, give way to maple, beech or oak and elm trees, such as you can see in that woodlot over there. They represent the last stage in the long sequence because young maples and beeches are able to grow successfully under the shade of the adult trees. And so the young trees in time take over from the older ones, all the while adding to the soil beneath.

This business of plant succession is going on around us all the time. The settlers and farmers have changed the stages of the natural succession in many places, but if the land were again left to itself, it would go back into forest.

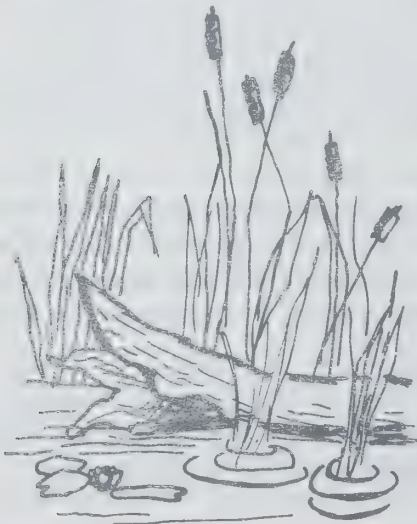
This type of succession is called 'dry succession' because it begins with plants growing on dry rock. There is another kind called 'wet succession' that we will come across another day.

'Wet' Succession

A while ago we talked about 'dry' succession. Here, by this pond, is a place where you can see an example of 'wet' succession.

Let's begin out in the middle of the pond, where it is quite deep. Floating around in the water are many extremely small plants called algae. They are so small that you need a microscope to see one. But collectively they add up to quite a lot — enough sometimes, to give the water a greenish or bluish colour.

These algae either sink to the bottom when they die, or they are eaten by small animals that, in turn, contribute to forming a bottom soil in which other plants can grow.



As we move shorewards from the deep water, the first new plants we come across are those that can grow entirely under water without emerging into the air. These are the true aquatic plants. You can sometimes see these by looking down into the water from a boat. They do need some sunlight though, and can't grow where the water is too deep. As these plants live and die, their remains tend to build up the bottom soil and so the pond gets shallower and shallower. Soon we reach a point where the water is shallow enough that plants like water lilies and pond lilies can have their roots in the bottom and still have their leaves and flowers above the water in the air.

Over a long period of time, these plants in turn add layers to the bottom, always tending to make the pond shallower. Soon we reach a stage of shallowness where first rushes and then cat-tail reeds can grow out of the water — just as you see them there.

As the water level drops to a few inches, sedges — such as these here — do very well in wet or moist soil. They bridge the crossing from water to land and then the grasses come in — as you can see here. And from this stage the plant succession follows the same route that we saw in 'dry' succession, ending up the same way with a forest of tall trees.

In 'wet' succession, the general tendency is for all the plants growing in the water to add to the bottom layer of soil so that the pond becomes shallower all the time. Eventually it may become a bog in which trees can get a foothold and the forest takes over. That is a long, slow process. But you may see bogs with trees such as tamaracks in them in which this process is going on.

Of course, there are also forces at work that lead to the creation of new ponds. Beavers, for instance, dam up streams and so make new ponds — but that is another story in itself!

An Old Log or Stump

When we talked about 'dry' and 'wet' succession we found that both stories ended up with a forest of tall trees where young trees grew up under the shade of the older trees and gradually replaced them as they died. In this country where forest is the natural cover of the land, you think of that process as just going on and on.

But there is another way of looking at it. What happens to the old trees when their limbs begin to break off or the whole tree crashes down in a wind storm? What happens to the stumps of trees that have been cut in a logging operation?

Well the answer is that they disintegrate into tiny pieces. Parts of them are eaten by insects or absorbed by plants' roots such as those of mosses; other parts fall directly onto the ground. One way or another, they return to the soil from which they once grew, enabling it to continue supporting the growth of more trees.

Einstein once remarked that although some things around us appear quite solid and permanent, yet, in fact, everything in this world is in motion. It is just that, in comparison with our brief lives, the motion in some things is so slow that we fail to notice it.

Take this old fallen tree trunk (or stump), for instance. Not so long ago it was a firm and growing tree. It looked much like the others that are around us



here. Now you can see that it has become soft and crumbly. Mosses of different kinds are growing thickly on its surface and their roots are spreading into it, tending to break it up. Various kinds of fungi — like the bracket fungus here — and moulds are doing the same thing. Here you can see that young trees are sprouting up from it and here is one that is several years old and well established. Their roots will grow deeply into the old wood and further break it down into smaller pieces.

Many animals of different kinds are also active in this breaking-up process. Here on the ground are little heaps of sawdust coming from the tunnels that wood-boring insects have made in the log. By digging into the wood a bit here you can see that there is a full-scale ants' nest in operation and ants do a pretty thorough job of demolition.

Larger animals take a hand too. Woodpeckers and other kinds of birds chisel away the bark and wood chips to get at the insects. Some day a bear may come along and rip the rotting wood to pieces to find grubs, ants or bees.

And so it will not really be long before what is left of the wood crumbles away completely (just as this handful has done) to become soil once more — soil that has the right animal, vegetable and mineral ingredients to nourish the new young trees that are growing up.

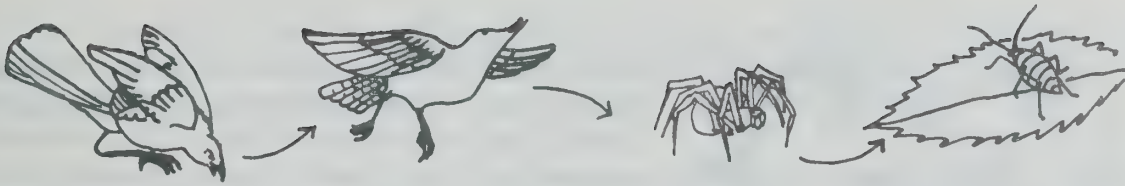
If we could take time-lapse pictures of this old log — say one picture a month for 50 or 60 years — and then run them all off in a 10-minute movie, we would see the log literally flying apart before our eyes and we would have further proof of Einstein's idea that 'everything is in motion'.

Food-Chains

When we discussed the old fallen tree, we saw that none of it was really wasted or lost — it was gradually returning to the soil where it would form the basis for the growth of more plants or animals.

This is an example of one part of the circle, or ring, or chain, around which the substance of living things circulates — changing form but always being in the process of circulation out of the earth and back into it.

People who study living things have a term — 'food-chain' — for this kind of process. For example:



This is the hawk - that ate the song bird - that ate the spider - that ate the aphid - that feeds on the leaf of the plant - that grows from the earth beside you.

What happens to the hawk? Well, if he's lucky, he dies of old age and gets eaten by scavenger beetles, but in one way or another his remains go back into the food-chain cycle.

Here are some more examples: grass — cows — you; seeds — mice — fox; algae — protozoans — crayfish — raccoon.

In general, it takes a very great many small things (seeds, algae, protozoans, insects) to feed the large number of medium-sized things (mice, crayfish, frogs) that are needed to keep alive the larger animals that eat smaller animals.

Seed Dispersal

We have talked about flowering plants as one of the largest and most important groups of plants. From the flowers come the seeds and if the different kinds of flowering plants are to thrive year after year, it is important for their seeds to be scattered over a wide area in order that a few of them may have the good luck to land in places where they can grow into full-sized plants. What is it the Bible says in the Parable of the Sower?

A sower went out to sow his seed: and as he sowed, some fell by the way-side; and it was trodden down, and the fowls of the air devoured it. And some fell upon a rock; and as soon as it was sprung up, it withered away, because it lacked moisture. And some fell among thorns; and the thorns sprang up with it, and choked it. And others fell on good ground, and sprang up, and bare fruit an hundredfold.

St. Luke 8, v—viii

Because so many of the seeds never have a chance to grow, for one reason or another, there must be a great many seeds in order that a few may spring up successfully. And there must be some way of providing the wide scattering of the seed for few plants can depend on a human sower to scatter their seed. Nature has other methods, and they are both ingenious and efficient.

Some of these seed-scattering methods you are already familiar with, if you stop to think about it. Take these dandelions growing here, for instance. You have all seen the little parachutes that drift away from the ripe heads. Sometimes they seem to fill the air with downy fluff. Maybe you have blown some off the tops of dandelions yourself, or played the game of seeing how long you could keep one of them afloat in the air by blowing it upward whenever it seemed to be falling. Did you know that each little parachute was carrying a seed? In this way, the wind carries dandelion seeds a great distance and the seed may take root a long way from the parent plant.



Milkweed is another example of a plant that uses little parachutes for seed dispersal. The parachute of the milkweed seed is really a marvelous structure. If some of those milkweed pods over there are ripe, we can open them and sail off a few parachutes ourselves.

Another type of seed that is carried by the wind is the maple key. You know what maple keys look like. The different kinds of maples have keys of different shapes, but they all work on the same principle. Maybe you have seen them floating down from the trees on your street.

Perhaps there are some around here. Who can

tell me where the nearest maple tree is? Do you know where the seed is in the maple key? Have a look for it the next time you see one.

Here is another thing to think about in connection with maple keys. Some of you have seen the great number — thousands probably — that a maple tree drops each year. Yet if, over a period of twenty years or so, only one of the seeds springs up and becomes an adult tree, the parent tree will have done its share in maintaining the number of maples. What happens to all the other keys? Are they wasted? No, they become food for all manner of small animals and the rest gradually disintegrate and help to form new soil.

There are still more kinds of seed dispersal. Think of the burs on burdock and other weeds. Did you stop to think why it was that burs stuck to your clothes? This is just another way that plants have of distributing their seeds widely. They depend on animals, such as sheep, deer, or bears — or people like yourselves — to carry their seeds away for them.

Who can think of any other methods of seed dispersal? How about bees and other insects that have seeds stick to them for awhile to drop off later somewhere else? Though they are not aware of it, birds also play a large part in dispersing seeds. A bird may pick a cherry from a tree and fly some distance to another tree, eat the cherry and drop the seed to the ground. Many seeds have such tough coats that they can pass through a bird's digestive tract unharmed and be carried far from the parent plant before they finally reach the ground.

Water currents provide still another means of travel for seeds that float. They may be carried by streams, rivers, lake currents — even oceans.

More than any other animal, man has unwittingly spread seeds far and wide. His ships and trains, aeroplanes and cars have accidentally carried seeds across oceans and continents. Many of the plants that now grow commonly around here were introduced from Europe in this accidental manner.

HOW WE FIT INTO THE PICTURE

Towards the end of the camping period it is a good idea to pull together some of the points you have been making and to spend a little time on the third objective of your program, letting the campers see how they fit into the picture.

First, you can bring home to them the knowledge that their's is a wonderful country and that we are fortunate to be living in it and able to enjoy it.

Second, you can point out that, fine as our countryside is, it could be better in many ways. For instance, on your campsite your stream could be clear instead of muddy, it could be fresh and pure for swimming instead of being polluted, it could run more steadily and at better volume during the summer. Then there are those bare wind-blown spots where the soil has become exposed and those gullies and wash-outs where rainwater has run off from the fields and hillsides, carrying soil down towards the stream. There could perhaps be more trees to give shade and anchor the soil on the hillsides. More young trees should be growing up to replace old ones as they die off. There could be more cover and food, possibly, for some of the animals you have come to know and love.

These small instances on or near your campsite are merely examples of a general condition in our countryside that has come about largely because people changed the environment with little thought as to what effect these changes might have.

It is up to each one of us, in our own community, to be keeping these things in mind so that we can work to maintain our natural assets and help to repair some of the damage that has been done to them in the past.

Man in Nature



Man's intelligence and his extensive language have permitted him to progress far beyond the other mammals in many ways. To ensure his food supply, he raised crops and domesticated animals. He has also developed tools and complicated methods of mechanical transportation. He can think about abstract ideas such as what is good and what is beautiful and what the purpose of something is. He can express these abstract thoughts and discuss them with other people. He has developed religion and philosophy and is in the process of assembling a knowledge of science.

The particular attribute of man that directly concerns us here is his ability, in fact eagerness, to make changes in his surroundings.

Your own campsite undoubtedly bears evidence of this. Not so long ago, a great forest probably grew there. Then the white settlers came in and cleared the forest to make farm land and sites for towns and cities. Roads were built. All this activity made and still is making great changes in the natural face of the country. Think of the way that the St. Lawrence River is being altered so that ocean boats can enter the Great Lakes or how marshes are being filled in or drained so that the land may be farmed. Housing developments are springing up and factories are being built as Canada grows in population.



These changes made it very difficult, even impossible, for some plants and animals to continue living there, so that they are much rarer now than they used to be (for example, white pine, wild orchids, moose). One of North America's once common birds is extinct — the passenger pigeon.

On the other hand, the new conditions made it possible for some plants and animals that were formerly quite rare to increase their numbers and become abundant (robins, and song sparrows for example). They also provided the opportunity for plants and animals brought by man from other countries to gain foothold and spread rapidly. Daisies, dandelions, starlings, house sparrows, the European hares called 'jack rabbits', Scots pine trees and many insects were not part of the natural life of Ontario when white men settled; they were introduced by accident or by design by people from other lands who came to make their homes in Canada.

Some of the effects of these changes are for the better, such as the building of dams to regulate the flow of water to various communities. However many of the effects are for the worse. The draining of some marshes has not only destroyed the habitats for many plants and animals but caused a drastic lowering of the depth of the underground water that feeds wells and nourishes plants in the surrounding area. The big question that man is now beginning to think about is: "How can these country-wide changes be wisely planned and controlled in order to maintain our heritage of soil, water, forests, and wildlife?" This is the question of conservationists. This is the question that you and your campers must think about too.

You can practise conservation in some of these ways:

- Learn to handle campfires wisely, thus setting an example for others.
- Bury rubbish instead of marring the landscape or polluting the water.
- Conduct a tree-planting project.
- Protect the habitats of plants and animals.
- Keep your eyes, ears and minds open in order to learn how plants and animals are related to one another and to their habitats.
- Never peel bark from a living tree; do not pick wildflowers only to throw them away.

EVALUATION

As you go along through the camping period — and particularly at the end of it — you should set down on paper your impressions and experiences about nature study in your camp. Once the camp is nearing its close, it is easy to slide over this task without getting it done. However, if completed, an evaluation report may well be the most valuable contribution you can make.

During the season you will have learned a good deal through experimentation, through trial and error. Give the people that follow you next year, and the years after, the benefit of your experience so that they can avoid some of the difficulties you encountered and thus make each camp more successful.

Were the four objectives achieved? Did the youngsters begin to show intelligent curiosity about nature and did their enthusiasm develop as the season progressed? Do you think they began to appreciate the ever-changing pattern of nature? Did most of them begin to show that they understood something about their own places in the natural world? How meaningful is the concept of habitat to them?

What were the techniques, approaches, projects and presentations that you found most successful? Which ones didn't go over well or proved to be too difficult to do or to understand? What new methods, projects or ideas have you to suggest?

These are the things we all want to know. If you will arrange for your camp to forward your report to the Community Programs Division of the Ontario Department of Education, 559 Jarvis Street, Toronto 5, you may be sure it will be given serious study. The results will benefit not only your own camp, but other camps throughout the province also.

REFERENCES

Just about all the knowledge you will need for your nature counselling can be obtained from the list of references set out in the next section. However, as we have suggested earlier, it helps a great deal to have first-hand contacts or correspondence with suitably informed people with whom you can discuss your problems.

These people are usually only too glad to help you — the trick is to locate them. Here are some suggestions.

THE FEDERATION OF ONTARIO NATURALISTS, 1262 Don Mills Road, Suite 49,
Don Mills, Ontario.

Many communities have naturalists' clubs. To find out the nearest club to you and the name and address of a member, write to the Executive Director of the Federation. If there is no club in your vicinity, they might be able to give you the name and address of a naturalist living in the area.

The F.O.N. also sponsors a magazine called the "Young Naturalist" that contains stories, questions and answers, pictures and other useful information about the natural history of Ontario — all written for young people. A year's subscription can be had for a nominal fee. You, as well as your campers, might be interested in this.

CANADIAN AUDUBON SOCIETY, 46 St. Clair Avenue East, Toronto

This organization sponsors adult and Junior Audubon Clubs (including a special club for camps), and publishes a vast amount of literature—much of it on the grade school level. It is sold at cost to teachers, club leaders and other interested persons. Write for their list of publications.

MUSEUMS AND UNIVERSITIES

If you are fortunate enough to have these institutions near by, call and visit the biology section. There is usually some exhibit material and someone who might help you locate equipment such as insect pins and live-traps.

National Museum, Ottawa

Royal Ontario Museum, Queen's Park, Toronto

U.S. National Museum, Washington 25, D.C.,

Queen's University, Kingston

University of Toronto, Toronto

University of Western Ontario, London

McMaster University, Hamilton

Ontario Agricultural College, University of Guelph

Carleton University, Ottawa

SCIENCE TEACHERS

Secondary school science teachers can help you a good deal. More than that, they are usually acquainted with those people in the district who are well-informed in natural history, and so can direct you to them.

PARK NATURALISTS

Most of the large provincial parks have one or more park naturalists who are glad to answer the questions of visitors. There are usually nature museums, nature trails and check-lists of animals and plants in these parks too.

CANADIAN GOVERNMENT

Federal All publications of the federal government can be ordered from the Queen's Printer, Ottawa, or directly from the department of the government that publishes them. Mention your position as a camp leader and ask for their publications list.

Provincial Several branches of the provincial government publish material that will be of interest to nature counsellors. The following list gives the most important ones.

Ontario Department of Agriculture, Queen's Park, Toronto

Ontario Department of Lands and Forests, Queen's Park, Toronto

Ontario Department of Mines, Queen's Park, Toronto

Department of Planning and Development, Queen's Park, Toronto

U.S. GOVERNMENT

All publications of the U.S. Federal Government can be ordered from the Superintendent of Documents, Washington 25, D.C., or directly from the branch of government that publishes them.

U.S. Department of Agriculture, Division of Publications, Office of Information, Washington 25, D.C.

U.S. Fish and Wildlife Service, Washington 25, D.C.

Wildlife leaflets and other publications of value. Many are free.

U.S. Forest Service, Washington 25, D.C.

Publications available on forestry and conservation.

U.S. Soil Conservation Service, Education Section, Washington 25, D.C.

Free material on soil conservation.

FIELD GUIDES AND TEACHING AIDS

General

1. Palmer, E.L. — A FIELDBOOK OF NATURAL HISTORY
McGraw-Hill, 1949 \$12.50
2. Brown, Vinson — THE AMATEUR NATURALIST'S HANDBOOK
Dodd, Mead, 1948 \$5.95

Rocks, Minerals and Soils

3. Pough, F.L. — A FIELD GUIDE TO THE ROCKS AND MINERALS
Thos. Allen, 1953 \$5.95
4. Province of Ontario — THIRTY-THREE MINERALS & TWENTY-TWO
ROCKS, Publications Section, Ontario Department of Mines, Toronto
\$5.25
5. Chapmani, L.J. and D.F. Putman — THE PHYSIOGRAPHY OF SOUTHERN
ONTARIO, University of Toronto Press, 1951 \$7.50
6. Zim, H.S. and R. Shaffer, R. Pearlman — ROCKS AND MINERALS
A Golden Nature Guide, Musson, 1958 \$1.35

Geography

7. Government of Canada — TOPOGRAPHICAL MAPS
Publications Section, Ontario Department of Lands & Forests, Rm. 2431,
Queen's Park, Toronto. 50¢ per sheet. (A map of your area may be obtained
from bookstores or from the above address.)
8. Province of Ontario — AERIAL PHOTOGRAPHS
Ontario Department of Lands and Forests, P.O. Box 157, Downsview
\$1.00 each (10" x 10")
9. Province of Ontario — AERIAL PHOTOGRAPHS
Ontario Department of Lands & Forests, P.O. Box 157, Downsview
Mosaics \$2.00 - \$6.00

Weather

10. Government of Canada (Write for pamphlets on children's weather
activities, Director of Meteorological Branch, Department of Transport,
315 Bloor St. W., Toronto 5) Free.
11. Lehr, P.E., R.W. Burnett and H.F. Zim — WEATHER
A Golden Nature Guide, Musson, 1957 \$1.35

Stars

12. Mayall, M.W. and R.N. Mayall — **FIELDBOOK OF SKIES**
Longmans Canada Ltd., Toronto, 1954 \$6.25
13. Royal Astronomical Society of Canada — **HORIZON MAPS**
Set of 4, free
14. Zim, H.S. and Baker — **STARS**
A Golden Nature Guide, Musson \$1.35
15. Royal Astronomical Society of Canada — **OBSERVER'S HANDBOOK**
252 College St., Toronto 2B (This is an annual almanac of the sky
month by month; 100 pages of useful information) \$1.00

Mushrooms and Toadstools

16. Smith, A.H. — **THE MUSHROOM HUNTER'S FIELD GUIDE**
Ambassador Books, 1958 \$8.95
17. Government of Canada — **EDIBLE AND POISONOUS MUSHROOMS OF CANADA** (A 43-861) Queen's Printer, Ottawa \$7.75
18. W.F. Thomas — **FIELDBOOK OF COMMON MUSHROOMS**
Putnam, 1948 \$6.25

Ferns and Their Relations

19. Eiffert, V. and B. Metcalfe — **NATIVE FERNS**
Canadian Audubon Society, 46 St. Clair Ave. E., Toronto \$1.00
20. Cobb, B.A. — **A FIELD GUIDE TO THE FERNS** (and their related families), Thos. Allen, 1956 \$5.95

Wildflowers and Weeds

21. Montgomery, F.H. — **COMMON WEEDS OF ONTARIO**, Bulletin No. 505
Ontario Department of Agriculture, 1955 free
22. F.H. Montgomery — **WEEDS OF CANADA & NORTHERN UNITED STATES**, Ryerson Press, 1964 \$4.95
23. Rickett, H. — **NEW FIELDBOOK OF AMERICAN WILDFLOWERS**
Longmans Canada Ltd., 1955 \$6.25
24. Wherry, E.T. — **THE WILDFLOWER GUIDE**, Doubleday Publ., \$5.95
25. Zim, H.S. and A.C. Alexander — **FLOWERS**
A Golden Nature Guide, Musson, 1948 \$1.35

26. House — WILDFLOWERS OF NEW YORK (264 coloured plates reprinted from volumes 1 and 2 of this work). New York State Museum, Albany 1 N. Y. \$2.50 plus postage (about 70¢). Make cheques or money orders payable to the New York State Education Department.
27. Government of Canada — FOREST FLORA OF CANADA, Bulletin 121 Queen's Printer, Ottawa, 1959 \$2.00

Trees and Shrubs

28. White, J.H. and R.C. Hosie — THE FOREST TREES OF ONTARIO Publications Branch, Department of Lands & Forests, Toronto, 1957 50¢
29. Government of Canada — NATIVE TREES OF CANADA, Bulletin 61 Queen's Printer, Ottawa, 1950 \$2.50
30. Matthews, F.S. — FIELDBOOK OF AMERICAN TREES & SHRUBS Longmans Canada Ltd., 1958 \$5.75
31. Van Camp, J.S. — FIFTY TREES OF CANADA Book Society of Canada 50¢
32. Petrides, G.A. — A FIELD GUIDE TO TREES AND SHRUBS Thos. Allen, 1958 \$5.95

Ponds and Streams

33. Morgan, Ann Haven — FIELDBOOK OF PONDS AND STREAMS Longmans Canada Ltd., 1930 \$6.25
34. Housman, Leon A. — BEGINNERS GUIDE TO FRESH WATER LIFE Longmans Canada Ltd., 1950 \$3.75

Spiders

35. Kurata, T.B. — SPIDERS, Royal Ontario Museum, Toronto 40¢

Insects

36. Lutz, F. — FIELDBOOK OF INSECTS, Longmans Canada Ltd., 1948 \$5.75
37. Beirne, B.P. — COLLECTING, PREPARING & PRESERVING INSECTS Canadian Department of Agriculture, Ottawa, 1955 (Pub. 932) \$2.00
38. Jacques, H.E. — HOW TO KNOW THE INSECTS Wm. C. Brown, 1947 \$2.25
39. Urquhart, F. — INTRODUCING THE INSECT, Clarke Irwin, 1949 \$5.00

40. Swain, R.B. — THE INSECT GUIDE, Doubleday Publishers, 1948, \$5.95
41. Zim, H.S. — INSECTS, A Golden Nature Guide, Musson, 1951 \$1.35
42. Klots, A.B. — A FIELD GUIDE TO THE BUTTERFLIES
Thos. Allen, \$5.95
43. Martin, R.A. — BUTTERFLIES AND MOTHS, Musson, 1958 \$1.35

Amphibians and Reptiles

44. Conant R. — A FIELD GUIDE TO THE REPTILES & AMPHIBIANS
(of Eastern N.A.) Thos. Allen, 1958 \$5.95
45. Logier, E.B.S. — THE SNAKES OF ONTARIO
University of Toronto Press, 1958 \$5.50
46. Zim, H.S. and M.S. Smith — REPTILES AND AMPHIBIANS
A Golden Nature Guide, Musson, 1953 \$1.35

Fishes

47. Zim, H.S. and Shoemaker — FISHES
A Golden Nature Guide, Musson, 1958 \$1.35

Birds

48. Peterson, R.T. — A FIELD GUIDE TO THE BIRDS (east of the Rockies)
Thos. Allen, 1947 \$5.95
49. Godfrey — BIRDS OF CANADA, Queen's Printer, 1966, \$12.50
50. Headstrom, R. — BIRD'S NESTS—A FIELD GUIDE
Musson Book Company, 1949 \$4.75
51. Royal Bank of Canada — BIRD HOUSES ARE FUN TO BUILD
Write Head Office, 360 James Street, Montreal, Quebec. free
52. Check lists. (These are merely lists of birds found in a certain area.
Write to the Royal Ontario Museum, Queen's Park, Toronto, for the
Toronto area list. 5¢ each)
53. Peterson, R.T. — HOW TO KNOW THE BIRDS, Sinnott News Co. 60¢
54. Cruickshank, Allan — THE POCKET GUIDE TO BIRDS
Sinnott News Co., 1954 60¢

Mammals

55. Burt, W.H. and R.P. Grossenheider — A FIELD GUIDE TO THE MAMMALS, Thos. Allen, 1956 \$5.95
56. Palmer, R.S. — THE MAMMAL GUIDE, Doubleday, 1954 \$6.25
57. Zulver, T. — MAMMALS, Pocket Nature Guides, 1963, \$1.00
Random House - Ottenhiemer Publishers
58. Bradt, G.W. — MICHIGAN WILDLIFE SKETCHES (Write to Michigan
Department of Conservation, Lansing, Mich. 48926 52¢)
59. Cahalane, U. — MAMMALS OF NORTH AMERICA
Collier-Macmillan, 1947 \$9.55
60. Zim, H.S. and D.F. Hoffmeister — MAMMALS
A Golden Nature Guide, Musson Book Company, 1955 \$1.35
61. Peterson — MAMMALS OF EASTERN CANADA, Oxford, 1966 \$15.95

Animal Tracks

62. Murie Olaus — A FIELD GUIDE TO ANIMAL TRACKS
Thos. Allen, 1954 \$5.95
63. Jaeger, E. — TRACKS AND TRAILCRAFT
Collier-Macmillan, 1948 \$5.95
64. Mason, G.F. — ANIMAL TRACKS, McLeod \$3.10

Conservation

65. Storer, J.H. — THE WEB OF LIFE, New American Library, 60¢
66. Bartlett, L.M. and G.E. Eddy — LEADERSHIP GUIDE IN CONSERVATION
EDUCATION, Department of Education, Board of Water and Light Building,
Lansing, Michigan (Bulletin 421) free
67. The Royal Bank of Canada — CONSERVING CANADA'S RESOURCES
Write to Mr. J. Heron, Royal Bank Headquarters, Montreal, Que. free
68. Weaver, R.B. — HANDBOOK FOR TEACHING CONSERVATION AND
RESOURCE USE, American Nature Assoc., 1214-16th Street N.W.,
Washington, D.C., 1955

69. Smith, F.C. — THE FIRST BOOK OF CONSERVATION
Ambassador Books \$3.75

Nature Activities

70. Canadian Audubon Society — CONSERVATION & NATURE ACTIVITIES
46 St. Clair Avenue E., Toronto, 1951 \$2.50
71. Hillcourt, W. — A FIELDBOOK OF NATURE ACTIVITIES
Longmans Canada Ltd., 1950 \$6.25
72. State of Michigan — FIELD TRIPS (A Handbook for Leaders)
Michigan Department of Conservation, Lansing, Mich., 48926 free
73. Government of Canada — COLLECTION AND CARE OF BOTANICAL
SPECIMENS (A 53-1113) Queen's Printer, Ottawa \$2.50
74. Federation of Ontario Naturalists — THE YOUNG NATURALIST
1262 Don Mills Road, Don Mills, \$1.00 per year, 10 issues

Selecting Your Nature Library

Considering the costs involved, you will have to be selective in your book-buying, building up your reference library over a period of time.

Your first selections might well be Reference 1, for the general field of nature study, and Reference 70 for nature activities. You might be able to get along tolerably well with just these two to begin with. References 1, 10, 19, 21, 23, 28, 41, 46, 48, 60, 70 and 72 would make up a quite adequate basic library at total cost of approximately \$30.

Besides these 74 listed references, there are a great many more that could have been mentioned with equal justification. Most of the listed references contain reference lists that will be helpful to anyone wishing to follow up any particular aspect of the subject.

NATURE STORIES

Grey Owl — THE ADVENTURES OF SAJO AND HER BEAVER PEOPLE
Macmillan \$3.95

Grey Owl — PILGRIMS OF THE WILD, Macmillan \$5.00

Lippincott, J. W. — PERSIMMON JIM, the Story of a Possum
McClelland & Stewart \$3.75

Lippincott, J. W. — STRIPED-COAT, the Skunk, McClelland & Stewart \$3.50

Lippincott, J. W. — BUN, a Wild Rabbit, McClelland & Stewart \$3.50

Lippincott, J. W. — BLACK WINGS, a Tame Crow, McClelland & Stewart \$3.50

Roberts, Sir Charles — THIRTEEN BEARS, Ryerson \$3.95

Roberts, Sir Charles — RED FOX, Ryerson \$3.50

Rounds, Glen — LONE MUSKRAT, Saunders \$3.95

Seton, E. T. — WILD ANIMALS I HAVE KNOWN, Saunders \$3.63

Seton, E. T. — BIOGRAPHY OF A GRIZZLY, McLeod \$2.75

Gall, A. C. and F. Crew — THE LITTLE BLACK ANT, Oxford \$3.45

Gall, A. C. and F. Crew — RINGTAIL, Oxford \$3.45

Note:

Most of the books listed here can be ordered or perhaps purchased directly from your local bookstore. In each reference (following the title) the publisher's name is given. The prices quoted are subject to change. When writing for, or ordering a book, mention your position as a natural history leader. Many publishers have discounts if the book is to be used for educational purposes.

Government publications can be obtained by writing directly to the department concerned.

PHONOGRAPH RECORDS

The following can be purchased at many record shops or ordered from the Federation of Ontario Naturalists, 1262 Don Mills Road, Suite 49, Don Mills, Ontario. A brochure is available on request.

Songs of Spring — \$5.95

Twenty-five of the commonest songbirds heard in Southern Ontario fields, hedgerows and woods. A good introduction to bird song.

A Day in Algonquin Park — \$5.95

Sounds of a summer's day in Ontario's northern woods (birds, frogs, insects, etc.). The loon calls are especially dramatic.

Warblers — \$5.95

More than 400 songs of the thirty-eight species of warblers known to breed regularly in eastern North America.

The Songs of Insects — \$8.75

A shrill symphony of forty varieties of grasshoppers, crickets, cicadas and katydids.

Voices of the Night — \$7.75

The calls of 34 frogs and toads of the United States and Canada including spring peeper, wood frog, mink frog, bullfrog, green frog and American toad.

American Bird Songs (2 volumes) — \$8.75 each

Over 50 songs in each volume given in habitat groupings.

Songbirds of America — \$5.95

Everything necessary for the understanding and identifying of 24 familiar songbirds. A booklet is included with a colour photograph and some information on the habits of each bird, as well as an introduction discussing general subjects from migration to building birdhouses.

An Evening in Sapsucker Woods — \$5.95

Songs and calls of a wildlife sanctuary in central New York State. The screech owl, green heron bobolink, bullfrog and American bittern are some of the animals heard.

